Aalto University
School of Business

THE RELATIONSHIP BETWEEN RISK-ADJUSTED PERFORMANCE OF ACTIVELY MANAGED MUTUAL FUNDS INVESTING IN EUROPEAN EQUITIES AND MACROECONOMIC FEAR FACTORS

Master´s Thesis
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Abstract of master's thesis

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Abstract

I find a significant relationship between a current level of some well-known macroeconomic fear factors which measure the prevailing economic or investor sentiment and subsequent equity mutual fund performance and stock market returns in European markets. When the level of macroeconomic fear in the beginning of a three or five-year measurement period is relatively high, the future stock market returns and mutual fund performance is expected to be relatively higher as well and vice versa. However, the results depend on a given macroeconomic fear factor, serial correlation adjustment procedure, time period and a risk-adjustment method with respect to mutual fund performance. This finding supports and complements previous results regarding the time-varying nature of mutual fund alpha presented for example by Kosowski (2011). This study also contributes to understanding how the new multi-factor composite sentiment indexes developed by Baker and Wurgler (2006) and Huang, Jiang, Tu and Zhou (2015) are linked to future equity mutual fund performance in Europe.

Keywords Equity mutual funds, Risk-adjusted performance, Sentiment, Macroeconomic fear

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Abstract of master's thesis

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Tutkielman aihe Eurooppaan sijoittavien aktiivisesti hoidettujen osakerahastojen riskikorjatun tuoton ja makrotaloudellisten pelkomittareiden suhde

Tutkinto Kauppatieteiden Maisteri

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Tiivistelmä

Tässä tutkimuksessa osoitetaan merkitsevä yhteys makrotaloudellisten pelkomittareiden ja tulevien osakemarkkinoiden tuottojen ja Eurooppaan sijoittavien osakerahastojen riskikorjattujen tuottojen välillä. Nämä makrotaloudelliset pelkomittarit mittaavat vallitsevaa talouden ja sijoittajien luottamusta tulevaisuuteen. Kun kyseisten pelkomittareiden arvo kolmen tai viiden vuoden mittaisen mittausjakson alussa on korkea, ovat tulevat osakemarkkinoiden tuotot ja osakerahastojen riskikorjatut tuotot myös suhteellisesti korkeampia ja päinvastoin. Saadut tulokset riippuvat kuitenkin käytetyistä tilastollisista menetelmistä, mittausjakson pituudesta sekä käytetystä riskikorjausmenetelmästä rahastojen keskimääräisen riskikorjatun tuoton arvioimisessa. Tässä tutkimuksessa saadut tulokset tukevat ja täydentävät aiempia löydöksiä rahastojen riskikorjatun tuoton ajassa muuttuvasta luonteesta, jota muun muassa Kosowski (2011) on tutkinut. Tutkimukseni lisää myös nykyistä tietämystä Bakerin ja Wurglerin (2011) sekä Huangin, Jiangin, Tun and Zhoun (2015) monta muuttujaa yhdistävien sijoittajien luottamusindeksien ja Eurooppaan sijoittavien osakerahastojen riskikorjatun tuoton välisestä yhteydestä.

Avainsanat Osakerahastot, Riskikorjattu tuotto, Pelko ja epävarmuus

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1. Introduction

Mutual funds are important. According to Investment Research Finland, the amount of total net assets of funds domiciled in Finland exceeded a EUR 100 billion threshold for the first time in October 2016 and the growth in assets over the last 20 years has been remarkable. Out of these assets about 37% are held in equity mutual funds which are predominantly actively managed. Actively managed equity mutual funds are important investment vehicles also elsewhere in the world.[1]

Despite more and more wealth flows into passively managed funds, actively managed funds are still the most popular choice in the field of equity mutual funds according to a data provider Morningstar. In addition, some scholars like Berk and Green (2004) conclude that passive and active funds should be seen as complementary products which supports a notion that actively managed funds are going to sustain their importance also in the future.

In this study I examine if different macroeconomic fear factors can predict the risk-adjusted performance of European actively managed equity mutual funds ex-ante. By European actively managed equity mutual funds I mean the all-equity funds that are focused in investing only in European stocks. Thus these funds and the corresponding fund management companies may be domiciled also outside Europe. I measure macroeconomic fear with seven variables that capture the prevailing investor or economic sentiment and a level of uncertainty in the financial markets.

Previous research in the field of macroeconomic timing and risk-adjusted performance of mutual funds has found strong evidence that an average alpha of actively managed equity mutual funds is time-varying and correlates with different macro-variables that one way or another measure macroeconomic fear. Moskowitz (2000) and Kosowski (2011) find that an average active manager is more likely to outperform the market during recessions than at other times, which is a valuable feature of active funds. Kosowski (2011), among others, also find that an average active fund performs better in periods of higher return dispersion and volatility, which are also likely to be periods of heightened uncertainty and opportunity. Avramov (2004) and Avramov and Wermers (2006) find that business cycle variables like dividend yield and credit default spreads can predict performance of actively managed equity mutual funds. In the hedge fund context, Avramov, Kosowski, Naik, and Teo (2011) find that macroeconomic variables

[1] Morningstar Direct, Lipper European Fund Market Review 2015

such as credit spread and volatility are important in ex-ante identifying groups of superior hedge funds.

According to Huang, Jiang, Tu and Zhou (2015), in stock markets investor sentiment[2] among many other macroeconomic predictors such as short-term interest rates, term spreads (i.e. term structure of interest rates), dividend yield, price-to-earnings and price-to-book ratio, stock volatility, inflation and corporate issuing activity have been successfully used to predict stock market returns in different time horizons.[3]

Findings of mutual fund alpha predictability and the above results concerning the time-varying nature of market risk premium make my study regarding macroeconomic fear factors and risk-adjusted performance of European actively managed equity mutual funds a fruitful topic in the context of those equity mutual funds that have been available to Finnish investors since 1998.

In this study I manually gathered a sample data from the Mutual Fund Archive of Investment Research Finland and for each month from January 1998 to December 2015 I calculated an equally-weighted average net-return of all actively managed equity mutual funds that invest in European stocks. On average every month includes data of 110 mutual funds and the sample size varies from 41 to 144 funds. Despite the fact that an average fund in this sample was not able to generate positive and statistically significant alpha in the long term or during a substantial majority of non-overlapping three-year periods, I found strong evidence that the average alpha correlates with the level of macroeconomic fear in the beginning of the measurement period of alpha. This means that high values of certain macroeconomic fear factors are associated with relatively higher alphas in the subsequent three and five-year periods. However, the results depend on a used risk-adjustment model and a way how autocorrelation in the given model is corrected. Also, some of the results hold only on one of the two time periods.

[2] A link between investor sentiment and stock market returns has been also studied by for example Kothari and Shanken (1997), Neal and Wheatley (1998), Shiller (1981, 2000), Baker and Wurgler (2000), Fisher and Statman (2000) and Baker and Wurgler (2006, 2007).

[3] Huang, Jiang, Tu and Zhou (2015) refer to Fama and Schwert (1977), Breen, Glosten, and Jagannathan (1989) and Ang and Bekaert (2007) regarding short-term interest rates, Fama and French (1988), Campbell and Yogo (2006) and Ang and Bekaert (2007) regarding dividend yield, Campbell and Shiller (1988) regarding price-to-earnings ratio, Campbell (1987) and Fama and French (1988) regarding term spreads, Kothari and Shanken (1997) and Pontiff and Schall (1998) regarding price-to-book ratio, French, Schwert, and Stambaugh (1987) and Guo and Savickas (2006) regarding stock volatility, Fama and Schwert (1977) and Campbell and Vuolteenaho (2004) regarding inflation and Baker and Wurgler (2000) regarding corporate issuing activity.

The main contribution of this study is that it validates some of the previous findings in the field of macroeconomic timing and mutual fund alpha predictability and also brings some new evidence that the proposed relationship holds also with non-American data and after the financial crisis era in Europe. I have also used variables such as Economic Sentiment Index (ESI) constructed by Eurostat which is to the best of my knowledge not used before in academic mutual fund performance research. Also the multi-factor composite indexes of Baker and Wurgler (2006) and Huang, Jiang, Tu and Zhou (2015) that measure investor sentiment are used to predict stock market returns but not risk-adjusted returns of actively managed equity mutual funds. To the best of my knowledge, this study is the first one that uses these composite indexes to study alpha predictability of Europe focused funds.

This study is organized as follows. Chapter 2 presents the brief history of mutual fund performance research as well as the most relevant findings regarding my research question. Chapter 3 describes the data and methods that are used in the analysis. Chapter 4 presents the empirical results of the study and Chapter 5 continues with a discussion of the results. Chapter 6 concludes.

2. Literature Review

This chapter presents the most seminal findings in the field of mutual fund performance research that are relevant regarding my research question.

2.1 Brief history of mutual fund performance research

A. Underperformance of actively managed equity mutual funds

As much I know, probably the first academic paper regarding mutual fund performance appeared already in 1966 in The Journal of Business, when economist William F. Sharpe published his study "*Mutual Fund Performance*". Among other things that helped to form a foundation of the modern portfolio theory[4], Sharpe (1966) finds that there exist a negative relationship between mutual fund expense ratios and fund performance measured by the so-called return-to-variability ratio which is later titled as the "Sharpe´s ratio". He also finds that by using this same risk-adjustment metric an average actively managed equity mutual fund was substantially unable to beat the corresponding performance of a Dow Jones Industrial Average index which tracks the performance of large American industrial companies and is often used as a benchmark index for domestic American funds. Sharpe´s empirical result was an opening shot to the discussion regarding the benefits of active portfolio management that is still intensively going on in the mainstream financial media and academic literature.

Another seminal paper was published in The Journal of Finance shortly after Sharper´s study in 1968 by Michael C. Jensen. In his paper, "*The Performance of Mutual Funds in the Period 1945-1964*", Jensen makes a similar conclusion as Sharpe and empirically shows that an average fund was not able to predict security prices well enough to outperform a passive buy-and-hold strategy. He also shows that there is very little evidence that any individual fund was able to do significantly better than that which was expected from mere random chance. In his paper, Jensen presents the famous performance metric, generally known as "Jensen´s alpha". This risk-adjustment metric is still widely used in academic research and practioners also refer to it when they talk about their possible ability to create value to their mutual fund customers. In my

[4] Sharpe (1966) continues with a discussion started in Sharpe (1963 and 1964) which are one of the first papers regarding the Capital Asset Pricing Model i.e. CAPM.

analysis, Jensen´s alpha is one of the four risk-adjustment metrics that I use to study fund performance and I present the underlying model in detail under the section “3.2 Risk-adjustment methods”.

Results regarding the underperformance of an average actively managed fund have since then been documented by several other scholars in studies that have different time periods and data sets as well as different risk-adjustment models that allow controlling for several factors simultaneously. High direct costs of active management which occur for example in a form of load-fees and management fees have been shown to be one of the key explanations for this underlying phenomenon. For example empirical studies of Malkiel (1995), Gruber (1996), Chalmers, Edelen and Kadlec (1999), Wermers (2000), Barras, Scaillet and Wermers (2010), Busse, Goyal and Wahal (2010) and Fama and French (2010) demonstrate that an average actively managed fund is not expected to outperform a passive portfolio in the long-term.

A theoretical paper of Sharpe (1991) concludes the basis for the underperformance observation. Sharpe (1991) states that an average investor will only receive an average gross-return in the long-term and therefore she should aim to reduce investing costs instead of trying to beat the market. “Before costs, the return on the average actively managed dollar will equal the return on the average passively managed dollar, and after costs, the return on the average actively managed dollar will be less than the return on the average passively managed dollar.” Recent analyses in this year conducted by commercial research companies like Morningstar have shown that an average actively managed fund has substantial difficulties to outperform also in the short-term[5] implying that Sharpe´s (1991) result holds regardless of the underlying time period of holding a fund.

After the results of Sharpe and Jensen, the mutual fund industry in the United States shortly developed a first completely passively managed equity mutual fund which only aim was to follow the S&P 500 index as closely as possible. Paul Samuelson had denoted in a Newsweek column in 1976 that a fund which simply aims to track its benchmark index should exist in the mutual fund market. In the same year the first passively managed index fund, First Index Investment Trust, was launched by John C. Bogle, the founder of an asset management company Vanguard. Since then passive portfolio management has received advocates from both academia and practice. Recently in the equity mutual fund market, the growth rate of AUM in

[5] Morningstar: “Fund Category Performance: Total Returns (data through 16.11.2016)”

passive index funds have outpaced the growth in active funds.[6] However, the majority of assets under management are still held in active funds and I analyse some potential reasons for this in the section 2.2.

B. New multi-factor risk-adjustment models that are based on CAPM

More recent financial literature has among other things focused on explaining the mutual fund performance with risk-adjustment models that extend the standard Capital Asset Pricing Model developed in the 1960s independently by Treynor (1962), Sharpe (1964), Lintner (1965) and Mossin (1966). CAPM itself has a strong theoretical foundation in the modern portfolio theory introduced by Markowitz (1952 and 1959).

Fama and French (1993) conclude that a model that in addition with the returns of a market portfolio proxy controls for the effects of a company´s size and a book-to-market ratio can better explain the cross-section in expected stock returns. In other words this means that in general the so-called Fama-French three-factor model produces a higher R^2 compared to a simple CAPM. This correspondingly means that the alpha estimate i.e. the intercept in the underlying regression analysis is a more suitable estimate of a fund manager´s performance. This view seems to be widely accepted in mutual fund research and many recent papers that study fund performance use the Fama-French three-factor model in an attempt to measure the fund performance. Fama and French (1996) that refer to a result in Carhart (1994) note that "the three-factor model provides sharper evaluations of the performance of mutual funds than the CAPM". In my study, this three-factor model is also what I use and its components are presented in detail under the section "3.2 Risk-adjustment methods".

Another widely used risk-adjustment model has been developed by Carhart (1997). Carhart´s (1997) four-factor model extends the three-factor model of Fama and French by controlling also a so-called momentum factor. The momentum factor is based on a result of Jegadeesh and Titman (1993) who find that portfolios which concentrate on stocks with strong past performance continue to outperform in the medium-term. This was then called the momentum anomaly. Carhart´s (1997) four-factor model captures the momentum effect in stock prices and hence can yield a better explanation for fund performance.

Even though the four-factor model of Carhart is widely accepted and used in mutual fund performance studies, the reason for momentum´s existence and also its suitability for a risk factor

[6] Morningstar Direct™ Asset Flows

is not unambiguous. For example Daniel, Hirshleifer and Subrahmanyam (1998) claim it to be a cognitive bias and thus investors´ irrationality. In this context also the results of Lakonishok, Shleifer and Vishny (1994) can be treated as an argument against the notion that momentum is a proper risk-factor. The scholars claim that institutional money managers have so short time horizons that they often cannot afford to underperform the index or their peers for any nontrivial period of time which leads them to chase performance in short-term winning stocks. On the other hand Crombez (2001) shows that momentum anomaly can exist in the efficient markets.

Despite the arguments presented against the momentum factor I use Carhart´s four-factor model as a risk-adjustment method. My reasoning is that if an average fund manages to generate alpha even after controlling for the momentum effect of Jegadeesh and Titman (1993), then the past performance has likely been superior. The model and its components are presented in detail under the section “3.2 Risk-adjustment methods”.

Besides the three-factor model of Fama and French (1993) and the four-factor model of Carhart (1997) also other multi-factor models have been used to study asset pricing and practical applications like mutual funds. Some of these models and the respective explanatory factors are presented for example in Pastor and Stambaugh (2003) and Fama and French (2015). In general, I see that in my study it is necessary to have different risk-adjustment methods because like Edelen (1999) states by referring to several mutual fund performance studies, “mutual fund performance is sensitive to the return benchmark”.

2.2 How to identify superior active portfolio managers *ex-ante?*

A. Active versus passive portfolio management

Like I mention in the previous section, the majority of equity fund assets globally are actively managed even though the standard finance theory argument clearly advocates passive index funds based on implications of modern portfolio theory of Markowitz (1952 and 1959), a two-fund separation theorem of Tobin (1958) and the efficient market hypothesis of Fama (1970). According to Kim and Boyd (2008), “The two-fund separation theorem tells us that an investor with quadratic utility[7] can separate her asset allocation decision into two steps: First, find the tangency portfolio, i.e., the portfolio of risky assets that maximizes the Sharpe´s ratio; and then,

[7] In financial economics, the utility function most frequently used to describe investor behaviour is the quadratic utility function. Its popularity stems from the fact that, under the assumption of quadratic utility, mean-variance analysis is optimal. Quadratic utility is $U(x) = X – bX^2$.

decide on the mix of the tangency portfolio and the risk-free asset, depending on the investor's attitude toward risk". A market portfolio represents the tangency portfolio (Sharpe, 1964).

Since Gruber (1996) researchers have studied possible reasons why investors choose an actively managed fund over a passive index fund i.e. a proxy for the market portfolio. One explanation for the popularity of active funds is that fund investors simply want to chase superior performance. Collins (2005) argues that the active and passive funds are not substitutes with each other. Active funds offer a possibility to risk-adjusted excess returns i.e. alpha which the passive funds that simply aim to track a benchmark index by definition do not. Berk and Green (2004) also focus on the possibility of the best active fund managers to generate alpha after their fees. The idea of Berk and Green (2004) is that fund investors chase performance even though the expected *ex-post* alpha is negative on average.

Behavioral finance scholars Jain and Wu (2000) and Barber, Odean and Zheng (2005) have also shown that the mutual fund marketing and advertising works. Barber, Odean and Zheng (2005) show that the funds that spend a lot of money in marketing gather greater subscription in-flows than the opposite funds. In addition, Barber, Odean and Zheng (2005) find that investors buy funds that attract their attention through exceptional performance. This theory supports the practical fact that the majority of fund assets are still actively managed.

Despite the phenomenal growth of index funds which is still going on in the mutual fund market, Jones and Wermers (2011) remind that there will always be demand for actively managed funds. Alpha-seeking active fund management industry will keep the markets as efficient as could be. "By making markets more efficient, active management improves capital allocation, and thus economic efficiency and growth, resulting in greater aggregate wealth for society as a whole". The authors also note that there are other benefits like liquidity, custody, bookkeeping, scale, optionality and diversification that actively managed funds provide. Value of these benefits to investors is difficult to quantify. Of course it can be said that index funds and liquid ETFs offer these same benefits, but still, the value proposition of active funds seem to be appealing to many investors. As a conclusion, mutual fund investors and especially retail investors can be seen as consumers who buy mutual funds based on different reasons. Wilcox (2003) states that consumers choose one mutual fund over another for a variety of reasons and their preferences with respect to certain attributes differ.[8] In my words, some prefer active management and others do not.

B. The field of equity mutual fund outperformance research

Despite the fact that numerous academic studies have found that an average actively managed fund underperforms, a large body of research has also identified several explanatory factors that correlate with superior performance. According to a literature review of Jones and Wermers (2011), findings of mutual fund outperformance research can be roughly divided in four groups. The first group comprises of results regarding a relationship between fund performance and characteristics of the fund manager or the fund itself. The second group consists of findings related to fund performance persistence. The third group is a more recent field of research and it deals with a holdings´ based analysis where the idea is to study how a fund´s portfolio holdings can predict future performance. This is interesting field not only because it has provided a new way to assess active managers and their effort but also because of a significant Finnish contribution to seminal results in this field. The fourth group is probably the most relevant with respect to my research question because it consists of findings related to macroeconomic timing and return predictability. Under the sections C - F, I present the most seminal findings in these fields in the context of equity mutual funds. Thus, I mostly exclude for example findings related to hedge funds, fixed income funds and other asset classes.

C. Fund performance and characteristics of a fund manager or a fund itself

Chevalier and Ellison (1999) find that characteristics of a fund manager that indicate ability, knowledge or effort can predict fund performance. Their key finding is that “managers who attended higher-SAT undergraduate universities have systematically higher risk-adjusted excess returns”. Gottesman and Morey (2006) continued the analysis started by Chevalier and Ellison (1999) and they find that there is also a relationship between a fund performance and an MBA program that a manager has taken. In particular they find that “managers who hold MBAs from schools ranked in the top 30 of the Business Week rankings of MBA programs exhibit performance superior to the performance of both managers without MBA degrees and managers holding MBAs from unranked programs”.

[8] Fama and French (2007) have made a same type of finding in the stock markets. They assume that investors have different preferences for different kind of stocks.

One problem that mutual funds encounter is that they often have to hold a small portion of a fund´s assets in cash i.e. uninvested in order to meet redemption needs which on the other hand decreases a fund´s long-term return expectation. According to Kostovetsky (2003) this phenomenon is called *a cash drag*. Edelen (1999) has shown that equity mutual funds that hold relatively more cash underperform. Edelen (1999) states that funds´ tendency to underperform results from liquidity service that fund managers provide investors. A practical implication is that equity mutual fund investors should avoid funds that hold a large cash position. I present more holdings-based research results under the subsection E.

D. Mutual fund performance persistence

Mutual fund performance persistence studies yield controversial results. It is a statistical fact that in any given year some funds will always beat the market. However, like for example Jensen (1968), Cornell (2009) and Barras, Scaillet and Wermers (2010) have concluded it might likely be only as a result of luck. And luck by definition is just a positive outcome of a random process and therefore it cannot be expected to remain.

This makes mutual fund performance persistence research interesting. I would say that the results regarding this field of research can be divided in two groups: short-term and long-term performance persistence.[9] Like Carhart (1997) states, “mutual fund persistence is well documented in the finance literature”. But Carhart (1997) also clearly states that “persistence in mutual fund performance does not reflect superior stock-picking skill. Rather, common factors in stock returns and persistent differences in mutual fund expenses and transaction costs explain almost all of the predictability in mutual fund returns”. In addition with Carhart (1997) many other scholars like Wilcox (2003) and Berk and Green (2004) have made the similar conclusion: past fund performance is a bad predictor of future performance. Interestingly and quite paradoxically, fund investors still prefer past winners (Mercer, Palmiter and Taha, 2010).

In this context the persistence in fund performance is sometimes measured by comparing actively managed funds with each other. For example, Carhart (1997) notes that the decile of funds with the worst performance continues to underperform also in the future. In general, the past performance of a mutual fund is a poor predictor of the future performance. This is also

[9] This division has been focal in a wider context of asset pricing. It was also a key theme in 2013 when the Nobel Prize in Economic Sciences was simultaneously awarded to Eugene Fama and Robert Shiller (as well as Lars Peter Hansen based on contributions in econometrics) for almost contradictory findings in financial markets.

what regulators in many countries require a fund company to state in their marketing material (Mercer, Palmiter and Taha, 2010).

In the short-term for example Hendricks, Patel, and Zeckhauser (1993), Goetzmann and Ibbotson (1994), Brown and Goetzmann (1995), and Wermers (1996) have found some evidence in favour of fund performance persistence. By short-term, authors often mean a time period between three months to three years. However, like Berk and Green (2004) have concluded, the outperformance persistence argument seems to hold only in the short-term or in “low liquidity sectors”. These are often sectors where markets are also informationally more inefficient.

In the long-term, there seems to be only little mutual fund outperformance persistence found in academic studies. Grinblatt and Titman (1992), Elton, Gruber, Das, and Hlavka (1993), and Elton, Gruber and Blake (1996) have discovered some stock-picking talent which leads to outperformance but the substantial majority of studies have concluded that the long-term fund performance persistence is non-existent and merely results from good luck like I described earlier.

Unfortunately like I have mentioned before, probably the most well-known fact in mutual fund research is that an average actively managed fund persistently underperforms and this is due to high management fees.[10] Professor Burton G. Malkiel has nicely formulated in his book Random Walk Down Wall Street, that “mutual fund business is the only business in the world where a customer gets what it does not pay for”.

E. Holdings-based analysis, i.e. how activity is related to performance

Academic research that studies the relationship between mutual funds´ activity and fund performance is a relatively new field of research in finance. Also Finnish contribution in this field is recognized globally. In these studies researchers have constructed metrics that measure a mutual fund´s activity. One of the most well-known metrics is a so-called *Active Share* invented by Cremers and Petäjistö (2009). Active Share measures the difference of proportions of all the stocks in a mutual fund and a most appropriate benchmark index. If the Active Share is low, the fund can be said to have low activity because the asset allocation closely follows or even replicates its benchmark index. On the other hand, if the Active Share is high it tells to a fund

[10] According to Morningstar (Kinnel, 2010): “Investors should make expense ratios a primary test in fund selection.”

investor that a portfolio manager has taken active bets that significantly deviate from the benchmark index. Activity of actively managed funds or in many cases a lack of it has gained much attention in mainstream media[11] but also in academic research (Puttonen 2015).

Cremers and Petäjistö (2009) and Petäjistö (2013) find that the most active stock pickers have outperformed their benchmark indices even after fees and transaction costs. Fund performance in these studies is measured by using benchmark-adjusted return and Carhart´s four-factor alpha before and after fees. However, after the publishing of these results and a wide-spread usage of Active Share in mutual fund industry some practioners have demonstrated substantial criticism against the measure. For example Russel Kinnel, director of research at Morningstar, has said that "it (Active Share) is a useful measure, but people are leaning way too heavily on it. It's more of a descriptor than a predictor and there is a lot that active share is not capturing".[12] The other founder of the Active Share measure, Martijn Cremers, has admitted in the same WSJ interview that Active Share is "more of a quick-and-dirty tool to give an investor a sense of what they're buying. But it must be interpreted cautiously". Jones and Wermers (2011) conclude that the result obtained by Cremers and Petäjistö (2009) is perfectly consistent with the costly information theory of Grossman and Stiglitz (1980) because the scholars did not control for the capitalization of the benchmark. According to Jones and Wermers (2011) the result of Cremers and Petäjistö (2009) can simply mean that small-cap funds outperform their corresponding benchmark index more often than large-cap funds do and this is how it should be because researching of small stocks is more costly.

My view of the Active Share is that despite the few flaws of the measure it has helped practioners and academic researchers to pay more attention to mutual funds´ activity and also the fees what actively managed funds are charging. According to Puttonen (2015), "closet indexing" a term coined by Cremers and Petäjistö (2009) is one of the most recognized "financial tricks" in mutual fund industry nowadays and some regulators are taking veritable actions in order to get rid of it. Norway´s Consumer Protection Authority recently threatened Norway´s largest bank, DNB, by a large fine if some of the actively managed equity mutual funds the bank manages refuse to lower the management fee of the funds because the funds practically replicate their

[11] Morningstar (2016)
[12] Wall Street Journal (5.6.2015)

benchmark index. The Authority said that “shareholders of the fund have not received the service which has been sold to them and which the customers have paid for i.e. active wealth management”.[13]

Cremers, Ferreira, Matos and Starks (2016) study the relationship between active management and indexing in an international sample of data and they conclude “that actively managed funds are more active and charge lower fees when they face more competitive pressure from low-cost explicitly indexed funds[14]”. Thus, index funds can offer other positive externalities than a higher expected return compared to actively managed funds – they also make investors that prefer actively managed funds better off if we assume that the negative relationship between costs and performance holds, which it most likely does according to the previous studies that I have pointed out.

Despite the popularity of Active Share it is not the only measure of a mutual fund´s activity. Also tracking error[15] relative to a proper benchmark index and R^2 of a fund are commonly used to measure a mutual fund´s activity from a different perspective.

Wermers (2003) finds that funds that deviate more from a benchmark index based on tracking error generate better risk-adjusted performance and the fund investors are therefore compensated for a manager´s activity. However, Petäjistö (2013) does not find positive and significant results regarding the relationship between tracking error and fund performance so the evidence is mixed in this case.

Amihud and Goyenko (2013) state that fund performance can be predicted by using its R^2, which is obtained by regressing the return of a fund on a benchmark portfolio. They find that a lower R^2, or higher idiosyncratic risk relative to total risk, measures selectivity or active management and by using it as a lagged explanatory variable in a model can significantly predict mutual fund alpha.

[13] Morningstar Finland (28.1.2016)
[14] An explicit index fund is openly a low-cost passive fund that aims to track its benchmark index. A closet index fund is on the contrary an actively managed fund that charges a fee of an active fund but replicates the asset allocation of a benchmark index.
[15] Tracking error measures the volatility of a fund return in excess of a benchmark, $\text{TE} = \text{Std.dev}(r_{fund} - r_{bm})$.

Kacperczyk, Sialm, and Zheng (2008) and Huang, Sialm, and Zhang (2010) study essentially how different kind of changes in a fund´s holdings affect on performance and practical implication of both of these studies is that “fund investors should avoid funds that do not maintain a stable risk profile” (Jones and Wermers, 2011).

As a conclusion to this subsection regarding how a mutual fund´s activity is related to its performance, the results are not fully consistent. This is not uncommon in mutual fund research. Often the results are very much dependent on the time period, sample data, methodological decisions and also to some extent scholars´ own subjective beliefs about the matter. However, what can be still concluded is that a fund which closely resembles its benchmark index and charges high fees in unlikely to deliver superior performance in the long-term. This can be also justified by using only common sense.

F. Macroeconomic timing and fund performance

From the point of view of my study this field of research and the underlying results are probably the most important ones because my research question is about macroeconomic timing. I present some of the findings under this subsection and continue in the next section “2.3 Mutual fund performance and macroeconomic fear factors”.

According to the literature review of Jones and Wermers (2011), in the equity mutual fund markets for example Moskowitz (2000) and Kosowski (2011) have found that an average active manager is more likely to outperform the market during recessions than at other times.[16] “This outcome is probably not the result of holding cash in down markets because Kosowski, in particular, adjusted returns for market risk. Instead, recessions are likely to be periods of above average uncertainty, when superior information and analysis can be particularly valuable. Consistent with this explanation, Kosowski, among others, also finds that an average active fund performs better in periods of higher return dispersion and volatility, which are also likely to be periods of heightened uncertainty – and opportunity.” The result of Kosowski (2011) holds in all of the separate equity fund categories (investment objectives) of his study.

[16] Some practioners like Joseph Paul (2009) from a research company AllianceBernstein have made a similar conclusion like Kosowski (2011) which on its part confirms the time-varying nature of a fund manager alpha with respect to prevailing market conditions i.e. return dispersion.

Avramov (2004) and Avramov and Wermers (2006) find that business cycle variables like dividend yield[17] and credit default spreads can predict performance of actively managed equity mutual funds. Even though in my analysis I do not focus on hedge funds I still see that a few results in that field should be mentioned. For example, Avramov, Kosowski, Naik, and Teo (2011) find that macroeconomic variables such as credit spread (or default spread) and volatility[18] are important in ex-ante identifying groups of superior hedge funds. In my analysis, I am particularly interested if this relationship holds also in the context of European actively managed equity mutual funds so not hedge funds.

2.3 Mutual fund performance and macroeconomic fear factors

The academic studies presented in the previous section show that volatility, credit spread and times of economic recession can be used to measure the level of economic fear and uncertainty and that they can have predictive power in stock markets and mutual fund performance. In addition, some recent studies have shown that different economic sentiment proxies and indexes can predict stock market performance.

For example Baker and Wurgler (2007) as well as Huang, Jiang, Tu and Zhou (2015) have shown that investor sentiment, when measured appropriately, is a powerful predictor of future stock returns. In my study I am interested in studying that would this also explain risk-adjusted performance of European equity mutual funds *ex-ante*.

Besides the two studies above, the role of sentiment has gathered attention also in other studies before.[19] Apparently John Maynard Keynes (1936) was the first one to note that human behaviour or "animal spirits" is likely to affect on the markets in a way that can cause severe mispricing of securities. Baker and Wurgler (2006) find in their analysis regarding cross-section of stock returns that low sentiment in the beginning of the period is associated with relatively higher subsequent returns and vice versa. However, this finding is not generalized to a whole market but instead the underlying relationship is observed among "securities whose valuations are highly subjective and difficult to arbitrage". For example small and high volatility stocks

[17] Shiller (1981) is the first one to show the relationship between dividend yield and subsequent stock market performance.
[18] In this study, volatility is measured by using CBOE volatility index (VIX) which is also what I use despite the fact that I have otherwise used European data instead of American.
[19] The role of sentiment in IPOs have been studied for example by Lee et al. (1991), Rajan and Servaes (1997), Lowry (2003), Derrien (2005), Ljungqvist et al. (2006), and Cornelli et al. (2006). IPO volume is also one of the factors in the sentiment index of Baker and Wurgler (2006) and Huang, Jiang, Tu and Zhou (2015)

belong to this category. The theoretical reasoning of my study is largely based on the finding of Baker and Wurgler (2006) but I just study the underlying relationship with different method and in a mutual fund context on a whole market-wide level. A literature review of Baker and Wurgler (2006) also points out that other scholars before have made a conclusion that sentiment helps to explain the time-series of stock market returns. Most notably Kothari and Shanken (1997), Neal and Wheatley (1998), Shiller (1981, 2000) and Baker and Wurgler (2000) have studied this relationship.

Fisher and Statman (2000) conclude that investor sentiment can be useful for tactical asset allocation because it has a negative relationship with future stock returns. One of the measures that the scholars use is the same Bull-Bear spread that I also use. It measures the level of American investor sentiment and it is compiled by the American Association of Individual Investors (AAII).[20] Overall the method how Fisher and Statman (2003) measure investor sentiment is largely based on surveys which has later been argued to be problematic because in reality people do not necessary behave in a way that they say in surveys.[21]

Sentiment is an interesting macroeconomic variable because it is not straightforward to observe, define and measure. It is not a tradable security. According to Kaustia and Knüpfer (2008), "there is no exact definition of sentiment, which is variably referred to as for example the average bullishness of noise traders (De Long et al., 1990a) or the propensity to speculate (Baker and Wurgler, 2006). In my study the bullishness of noise traders is measured by using a Bull-Bear spread. The Bull-Bear spread can also be used as a proxy for optimism or pessimism towards stocks in general, which is again one definition of investor sentiment according to Baker and Wurgler (2006). Kaustia and Knüpfer (2008) continue that "empirically, sentiment seems to be positively related to investor and consumer confidence, as well as past market returns".[22]

Fisher and Statman (2003) state that increases in consumer confidence are accompanied by statistically significant increases in bullishness of individual investors i.e. investor sentiment.

[20] Therefore I have to make an assumption that American investor sentiment is an appropriate proxy for European investor sentiment.
[21] This was again seen in the presidential election in the U.S. in 2016 when surveys failed to predict the winner. Surveys therefore measure *explicit* but not necessarily *implicit* behaviour. Also Da, Engelberg and Gao (2015) who refer to Singer (2002) point out that surveys are a problematic method to gather data.
[22] Baker and Wurgler (2006) however notice that historically not all stock market bubbles (and subsequent crashes) have needed high level of investor sentiment to occur. A so-called "Nifty-Fifty" bubble in the 1970s is an example of that.

They also note that (in the U.S.) consumer confidence predicts the economy (growth, consumption and other expenditures) and some stock market returns but it is not a reliable predictor of S&P 500 stock returns. Unlike in my study where I analyse the effect of sentiment in a time horizon of three to five years Fisher and Statman (2003) analyse the effects between a given month and the following month, thus their time horizon was substantially shorter than mine.

I control the level of consumer confidence by using the Economic Sentiment Index (ESI) complied by Eurostat as one of the explanatory variables in my analysis. In general, like Baker and Wurgler (2006) state, there are no definitive or uncontroversial measures for investor sentiment as prior research suggests several alternative proxies for investor sentiment to be used in a time-series analysis. This means that in an empirical analysis it is better to use several measures of sentiment. The multi-factor sentiment indexes of Baker and Wurgler (2007) and Huang, Jiang, Tu and Zhou (2015) take this directly into account but I also complement them with other simple proxies of sentiment or macroeconomic fear. The sections 3.1 and 3.3 present the variables that I have decided to use in detail.

One study that tries to explain the relationship between sentiment and stock market performance is conducted by Barberis, Shleifer and Vishny (1998). The authors show that in the time periods between 3 to 5 years, markets have a tendency to overreact to news. For example, "securities that have had a long record of good news tend to become overpriced and have low average returns afterwards. Put differently, securities with strings of good performance, however measured, receive extremely high valuations, and these valuations, on average, return to the mean". This result obviously casts a shadow on the efficient market hypothesis expressed originally by Fama (1970). However, the joint hypothesis problem inherent in stock market performance studies complicates or makes it even impossible to say anything about market efficiency. An origin of the joint hypothesis problem is presented for example in Fama (1991).

As a conclusion, macroeconomic fear factors have a strong behavioral aspect and they can be defined and measured in many different ways. In academic research macroeconomic fear factor which is a general term used in financial media is often meant as a synonym to investor sentiment and its various proxies. Thus, when I talk about macroeconomic fear factors later on in this thesis I mean all the seven explanatory variables used in my analysis.[23]

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[23] To make it sure, this is not necessarily always the case in academic research. For example David and Veronesi (2008) refer only to VIX and put-call-ratio of S&P500 index options when they talk about investor fear.

3. Data and Methods

This chapter presents the data, methods and testable hypotheses used in my study.

3.1 Data

The mutual fund return data can be downloaded in the web page of Investment Research Finland under the Mutual Fund Reports Archive for free. These reports are in pdf-format and they include among other things monthly net-returns of actively managed equity mutual funds that invest in European stocks. Besides domestic funds and funds domiciled in Finland there are also funds from other asset management companies. This is good because by studying only domestic funds that invest in European stocks the sample size would probably be too small in order to obtain results with enough statistical significance. The number of funds varies in time but there is on average about 110 mutual funds in any given month. The time period in my study starts from January 1998 and lasts until the end of December 2015. This makes 18 years in total. The underlying time period covers for example the IT-bubble of the early 2000s, financial crisis in 2008–2009 and the subsequent euro crisis as well the recent uncertainty regarding the expectations of future monetary policy changes and growth fears of China among many other things. Therefore this time period is suitable for studying the relationship of different macroeconomic fear factors and mutual fund performance. The underlying table describes the key attributes of the data.

Table 1. Key Attributes of Dependent Variables from 1998 to 2015

The table reports an average number of equity mutual funds of my sample from January 1998 to December 2015 noted as Avg. N of Funds. This number contains only those funds that clearly denote that they are focused to invest in European stocks and they are actively managed. MSCI Europe TR is the average return of the corresponding benchmark index during a time period given in the column Time Period. Index Fund Portfolio is the average net-return of all passively managed equity mutual funds and ETFs that invest in European stocks. Net-Return (all funds) is the average return of all the actively managed funds in my sample that invest in European stocks. Benchmark-adjusted return is an average benchmark-adjusted return of the actively managed equity mutual funds that invest in European stocks. CAPM Alpha, Fama-French Alpha and Carhart´s Alpha are the corresponding risk-adjusted monthly returns of all the actively managed equity mutual funds in my sample that invest in European stocks. These returns are calculated by using the factor models presented under the section 3.2. Risk-adjustment methods. Adj. R^2 (1998-2015) is the adjusted R-squared of the corresponding factor model during the time period of January 1998 to December 2015.

Time-Series Averages of Monthly Observations, 1998 - 2015								
Time Period	*Avg. N of Funds*	*MSCI Europe TR*	*Index Fund Portfolio Return*	*Net-Return (all funds)*	*Benchmark-adjusted return*	*CAPM Alpha*	*Fama-French Alpha*	*Carhart´s Alpha*
98-00	41	1.05	1.30	1.94	0.89	1.02	1.22*	1.21
01-03	98	-1.33	-1.31	-1.26	0.07	-1.17**	-0.67	-0.45
04-06	116	1.25	1.35	1.68	0.43	0.39	-0.39	-0.50
07-09	137	-0.78	-0.86	-0.93	-0.15	-0.61	-0.51	-0.55
10-12	122	0.53	0.39	0.37	-0.16	0.15	0.12	0.02
13-15	144	0.92	0.91	1.10	0.18	0.70*	0.81**	0.65
98-15	110	0.26	0.28	0.46	0.20	0.06	0.17	0.27
Adj. R^2 (1998-2015)						0.63	0.67	0.68

Note: The coefficients in the return data are percentages (e.g. 1.00 = 1%)
Statistical significance: * < 10%, ** < 5%, *** < 1%

Three important notifications can be drawn from the table 1.

Firstly, the number of funds has increased quite substantially from the beginning of the measurement period. In the period of 1998–2000 there were only about 41 funds on average whereas in the period of 2013–2015 the number of funds had increased to about 144. This means that the empirical results of my study that are obtained in the beginning of the period may not be as reliable as the results obtained later due to a smaller sample size.

Secondly, there are obvious signs of the so-called self-selection bias in the data of Investment research Finland. According to Heckman (1977), selection bias can occur when the data in a model is non-randomly collected. Even though I have collected the data properly and used all the funds that invest in European stocks the data itself is not unbiased. The self-selection bias in this case can happen when the mutual fund companies send only information of their best performing funds to the report constructor. Thus, they essentially select themselves into a group which causes a biased sample. From their point of view, the Mutual Fund Report may be more like marketing material for potential customers who buy the reports rather than a contribution to science. The effect of self-selection bias can be seen in the average benchmark-adjusted return column in Table 1. During the time period from 1998 to 2015 (18 years) an average mutual fund was able to beat its benchmark index with a hefty 0.2% marginal (net of fees) on a monthly basis. On an annual basis this means about 2.4% overperformance of the average fund which is a result that is rarely obtained in seminal mutual fund performance papers. For example, Jensen (1968) and Malkiel (1995) have empirically identified the phenomenon that an average actively managed equity mutual fund is unable to beat its benchmark index. Sharpe (1991) makes a similar conclusion in his theoretical paper. The literature review part presents the rest of the results in this context.

Another reason that may also explain the historical positive benchmark-adjusted return of the average fund is a limited sample size in my study. Here I am dealing with hundreds of funds whereas in many seminal studies the sample sizes are in a level of thousands or tens of thousands. Still, I believe that the sample size is adequate enough to find an answer to my research question because I am not interested in fund performance as such but rather the performance differences in different macroeconomic environments. In that case only the difference in performance is in my interest and not the level of it.

Thirdly, despite the likely self-selection bias the estimated risk-adjusted return by using the three different factor models (that I describe in detail later in this study) is not statistically significant from zero in the period of 1998–2015. By using the Carhart´s four-factor model to estimate the mutual fund alpha, the average fund is unable to generate statistically significant performance (under- or overperformance) in any of the six three-year sub-periods. The three-factor model of Eugene Fama and Kenneth French yields a significant positive alpha in the period of 1998–2000 and 2013–2015. The Jensen´s alpha (CAPM alpha) is significantly negative in 2001–2003 and positive in 2013–2015. Due to the above fact that the fund performance by using this data depends on the risk-adjustment model I regard it important to use different models to find an answer to my research question. Otherwise I might end up with a wrong conclusion about the proposed relationship between fund performance and macroeconomic fear factors.

The factor data that is needed to calculate the average monthly risk-adjusted mutual fund performance i.e. the monthly alphas, can be downloaded from Professor Kenneth French´s database in csv-format which can be then transformed to Excel-format. The underlying database includes also the estimates of the monthly risk-free rate for the whole time period in 1998–2015.

Benchmark index data of European stocks can be obtained also from the database of Investment Research Finland. The benchmark index that I use in my analysis is the MSCI Europe Total Return Index. According to MSCI, The MSCI Europe Index captures the large and mid-cap representation across 15 developed markets countries in Europe. With 446 constituents, the index covers approximately 85% of the free float-adjusted market capitalization across the European developed markets equity universe. Thus, this index can be reasonably characterised as a suitable metric to be used in the calculation of benchmark-adjusted returns.

Definitions of the below independent variables are presented in section 3.3. Here I describe where this data is obtained from:

The Economic Sentiment Index (ESI) data can be obtained in an Excel-format from the webpage of Eurostat for free.

CBOE volatility index data and BofA Merrill Lynch Euro High Yield Index Option-Adjusted Spread© data can be downloaded for free in St. Louis Fed´s (FRED) database in Excel-format.

The Bull-Bear spread data can be downloaded for free in the webpage of the American Institution of Individual Investors in Excel-format.

The data of the investor sentiment index constructed by Huang, Jiang, Tu and Zhou (2015) as well as the data of the sentiment index of Baker and Wurgler (2006) can be obtained in Excel-format for free in the web page of Professor Guofu Zhou.

The data regarding times of economic recession can be retrieved from the data of economic growth in Europe. This data is freely available in the webpage of Eurostat.

3.2 Risk-adjustment methods

I study the fund performance with four methods. First method is a simple benchmark-adjusted return, where the arithmetic averages of monthly mutual fund total returns is compared to MSCI Europe Total Return Index. This method is often used in mutual fund research to study fund performance. However, it is rarely used on a standalone basis and therefore it needs to be complemented with other more sophisticated risk-adjustment methods. I estimate benchmark-adjusted return in a same way as Gruber (1996):

$$Benchmark - adjusted\ return_t = r_t - Total\ return\ of\ the\ index_t, \quad (1)$$

t = 1, 2, … , T

where r_t is the monthly equally-weighted average return of a portfolio of European equity mutual funds during a period of 36 to 60 months. This return is not measured against a corresponding risk-free rate and it is net of fees. $Total\ return\ of\ the\ index_t$ is by definition the total gross return of the benchmark index during the same period.

The more sophisticated risk-adjustment methods require an asset pricing model – one factor or a multi-factor model. The first model is the basic capital asset pricing model i.e. CAPM and the other two are extensions of that. The second model is the Fama-French three-factor model and the third one is the Carhart´s four-factor model. I estimate these models as the following time-series regressions:

$$r_{i,t} = \propto_{i,T} + \beta 1_{i,T} MKTRF_{i,t} + \varepsilon_{i,t}, \quad (2)$$

$$r_{i,t} = \propto_{i,T} + \beta 1_{i,T} MKTRF_{i,T} + \beta 2_{i,T} SMB_{i,T} + \beta 3_{i,T} HML_{i,T} + \varepsilon_{i,t}, \quad (3)$$

$$r_{i,t} = \propto_{i,T} + \beta 1_{i,T} MKTRF_{i,T} + \beta 2_{i,T} SMB_{i,T} + \beta 3_{i,T} HML_{i,T} + \beta 4_{i,T} MOM_{i,T} + \varepsilon_{i,t}, \quad (4)$$

t = 1, 2, … , T

where $r_{i,t}$ is the monthly equally-weighted average return of a portfolio of European equity mutual funds in excess of the one-month risk-free rate; $MKTRF$ is the excess return of a value-weighted portfolio of all European stocks; SMB, HML and MOM are returns on value-weighted, zero-investment, factor-mimicking portfolios for size, book-to-market equity and one-year momentum in stock returns. The error term in the regressions is denoted by $\varepsilon_{i,t}$. My primary interest in these regressions is the intercept term, $\propto_{i,T}$, which is an estimate for the risk-adjusted return of the sample portfolio of mutual funds.

All the factor data and the estimate of a risk-free rate is retrieved from Professor Kenneth French´s database.

3.3 Explanatory variables

The explanatory factors that I use to predict these risk-adjusted returns i.e. the alphas ($\propto_{i,T}$) and benchmark-adjusted returns are the following:

ESI – According to Eurostat, the Economic Sentiment Indicator (ESI) is a composite indicator made up of five sectoral confidence indicators with different weights: Industrial confidence indicator, Services confidence indicator, Consumer confidence indicator, Construction confidence indicator and Retail trade confidence indicator. Confidence indicators are arithmetic means of seasonally adjusted balances of answers to a selection of questions closely related to the reference variable they are supposed to track (e.g. industrial production for the industrial confidence indicator). Surveys are defined within the Joint Harmonised EU Programme of Business and Consumer Surveys. The economic sentiment indicator (ESI) is calculated as an index with mean value of 100 and standard deviation of 10 over a fixed standardised sample period. Data are compiled according to the Statistical classification of economic activities in the European Community, (NACE Rev. 2).

$CBOE\ volatility\ index$ – According to Chicago Board Options Exchange (CBOE), the CBOE volatility index (also known as the VIX-index) is a measure of the implied volatility of S&P 500 index options. The VIX is calculated by the CBOE. In the mainstream media, this metric is often referred to as the fear index or the fear gauge of investors. The CBOE volatility index represents one measure of the market's expectation of stock market volatility over the next 30-day period and is therefore a suitable proxy for the prevailing uncertainty regarding the future and it is therefore a macroeconomic fear factor as such. Since its introduction in 1993, the VIX Index has been considered by many to be the world's premier barometer of investor sentiment and market volatility. According to CBOE bulletin in 2003, one of the most interesting features of VIX, and the reason it has been called the “investor fear gauge,” is that, historically, VIX hits its highest levels during times of financial turmoil and investor fear.[24]

$Credit\ spread$ – Credit spread or more precisely, Bank of America Merrill Lynch Euro High Yield Index Option-Adjusted Spread© tracks the performance of Euro denominated below investment grade corporate debt publicly issued in the euro domestic or eurobond markets. The BofA Merrill Lynch OASs are the calculated spreads between a computed OAS index of all bonds in a given rating category and a spot Treasury curve. The correlation between the level of the underlying credit spread and the level of economic uncertainty has historically been high.

[24] I have not checked this from the underlying CBOE bulletin but cited it directly from David and Veronesi (2008)

That means that this variable is another suitable proxy to measure the prevailing level of macroeconomic fear.

$Bull - Bear\ spread$ – The Bull-Bear spread measures the level of American investor sentiment and it is compiled by the American Association of Individual Investors (AAII). Since 1987, AAII members have been answering the same simple question each week. The results are compiled into the AAII Investor Sentiment Survey which offers insight into the mood of individual investors. More precisely, this metric measures the relative difference between investors who predict that stock prices in the United States will increase in the near future compared to those who believe that the stock prices will decrease in the same time period.

$HJTZ\ Investor\ Sentiment\ index$ – The investor sentiment index constructed by Huang, Jiang, Tu and Zhou (2015) is a new investor sentiment index that is aligned with the purpose of predicting the aggregate stock market. According to the scholars, "by eliminating a common noise component in sentiment proxies, the new index has much greater predictive power than existing sentiment indices". The underlying scholars also argue that it outperforms well recognized macroeconomic variables and can also predict cross-sectional stock returns sorted by industry, size, value, and momentum.

$BW\ Investor\ Sentiment\ index$ – The sentiment index of Baker and Wurgler (2006) is another investor sentiment index, though it is older than the investor sentiment index constructed by Huang, Jiang, Tu and Zhou (2015). The index is based on six different proxies of investor sentiment: trading volume as measured by NYSE turnover; the dividend premium; the closed-end fund discount; the number and first-day returns on IPOs; and the equity share in new issues. Just like the investor sentiment index constructed by Huang, Jiang, Tu and Zhou (2015), the authors claim that this index outperforms the generic and simple confidence-based sentiment proxies.

$Recession\ month$ – It has been previously shown for example by Moskowitz (2000) and Kosowski (2011) that the average active manager is more likely to outperform the market during recessions than at other times. This outcome is probably not the result of holding cash in down markets because Kosowski, in particular, adjusted returns for market risk. Instead, recessions are likely to be periods of above average uncertainty, when superior information and analysis can be particularly valuable. In my thesis, I will control recession periods as a dummy variable. However, in my analysis I consider any given month to be a recession month if the level of real gross domestic product is lower than the value exactly one year ago. Thus, this is my own definition of recession and does not follow the common definition of recession which is often defined as a decline in real GDP for two consecutive quarters.

As can be seen, besides using purely European variables such as ESI, Credit spread and Recession month I also use variables that are based on American data. I do not believe that this is an issue even though it would obviously be better to have completely "domestic" data. This is because historically the correlation between European and American stocks have shown to be high though time-varying. I also assume that if American investors, consumers and corporations have a reason to be worried about the future then the same group in Europe should also be equally worried because the substantial majority of European companies are affected by the same macroeconomic factors as American companies.

3.4 Testable hypotheses

In this study I make two main hypotheses which I have then divided into seven different testable hypothesis – one for each of the explanatory variable. This division makes the statistical analysis of my research question more straightforward. Like I have presented in the literature review, mutual funds tend to deliver better performance in times of high uncertainty and return dispersion. In addition, business cycle variables like credit default spreads can predict performance of actively managed equity mutual funds. On the other hand, the stock market performs better preceding times of low sentiment and some stocks are especially sensitive to investor sentiment as Baker and Wurgler (2007) demonstrate. In this study my primary goal is to examine besides the traditional factors (prevailing uncertainty, return dispersion and a general state of the economy) if also the sentiment indexes and other proxies for macroeconomic fear could predict mutual fund performance.

The first hypothesis is:

"A level of economic sentiment has a significant negative relationship with the future mutual fund performance".

The relationship between investor sentiment and risk-adjusted performance of mutual funds is something that (to the best of my knowledge) has not been studied before. However, my hypothesis and reasoning is that because the stock market and especially a certain kind of stocks have been shown to be sensitive to investor sentiment, it makes mispricing possible, and an average manager can exploit this and hence deliver alpha. I admit that this logic may not be endorsed by all of the finance scholars but still I see it is worth testing for because it can increase our current knowledge about the time-varying nature of alpha.

The second hypothesis is:

"A level of investor sentiment has a significant negative relationship with the future mutual fund performance".

Based on the explanatory variables presented before, the testable hypotheses are:

H1: "Eurostat´s Economic Sentiment Index has a significant negative relationship with the future mutual fund performance."

H2: "CBOE volatility index has a significant positive relationship with the future mutual fund performance."

H3: "Credit spread has a significant positive relationship with the future mutual fund performance."

H4: "Investor sentiment measured by AAII´s Bull-Bear-spread has a negative relationship with the future mutual fund performance."

H5: "The investor sentiment index constructed by Huang, Jiang, Tu and Zhou (2015) has a significant negative relationship with the future mutual fund performance."

H6: "The sentiment index of Baker and Wurgler (2006) has a significant negative relationship with the future mutual fund performance."

H7: "Times of economic recessions have a significant positive relationship with the future mutual fund performance."

In all of the above statements, I mean benchmark-adjusted return and the alpha estimated by the three factor models when I talk about mutual fund performance.

These hypotheses will be tested with a simple linear model[25]:

$$Performance_{i,t} = \propto_{i,T} + \beta 1_{i,T} FEARFACTOR_{i,t} + \varepsilon_{i,t}, \quad (5)$$

[25] Serial correlation can affect on the statistical significance of the results due to the overlapping data. However, for example Fisher and Statman (2000) found that statistical significance of their results in the group of small stocks was upwards biased which was indicated by a Durbin-Watson statistic of 1.28. In large stocks this was not an issue. I analyse the problem of serial correlation later on in this section.

where $Performance_{i,t}$ is the monthly risk-adjusted performance estimated separately with the previous four risk-adjustment methods during a 36 and 60-month period after an observation of each of the underlying explanatory variable. $FEARFACTOR_{i,t}$ represents these variables that have been introduced above in the section 3.3.

In the section 4.3 I divide the results in quintiles and compare them with each other. Besides a one-way ANOVA test that can be conducted by using Excel´s data analysis tools I also use an alternative non-parametric Kruskal-Wallis test by using the underlying formula to estimate the corresponding H-statistic:

$$H_i = [\frac{12}{n(n+1)} \sum_{k=1}^{K} n_k R_k^2] - 3(\text{n}+1), \tag{6}$$

k = 1, 2, 3, 4, 5 in the comparison of all quintiles and 1, 2, 3 otherwise

where H_i is the underlying H-statistic that in a large sample case follows the distribution X^2(K-1), K is the number of quintiles, n is the total sample size, n_k is the sample size of the kth quintile and R is the mean rank of the kth quintile. Large values of the Kruskal-Wallis test lead to a rejection of the hypothesis that there is no statistically significant difference between the quintiles i.e. the mean ranks are equal.

In order to increase validity of the results and make them more robust, I also calculate Durbin-Watson d-statistics to all of the seven regressions and for both time periods. Like Fisher and Statman (2000) clarify in a note 2 of their paper, “the statistical significance of the relationship between the level of sentiment and future returns might be biased if serial correlation exists in the residuals of the regressions”. I calculate the Durbin-Watson d-statistics to test for AR(1) serial correlation by using a Stata program. According to Woolridge (2009) the test statistic d is determined as follows:

$$\text{d} = \frac{\sum_2^T (\varepsilon_t - \varepsilon_{t-1})^2}{\sum_1^T \varepsilon_t^2}, \tag{7}$$

where T is the number of observations and ε_t is the error term. The value of d is always between the range of 0 and 4. If d = 2 there is no serial correlation. If d is significantly less than 2 there is evidence for positive serial correlation and if d equals more than 2 there is evidence of negative serial correlation. According to Woolridge (2009), the exact critical values are dependent on a sample size and a number of explanatory variables and they can be obtained from Savin and White (1977).

Finally, I estimate the simple linear model (5) by using Cochrane and Orcutt (1949) as well as Newey and West (1987) estimation procedures to adjust the model for possible serial correlation in the error term. I conduct both of these operations by using Stata´s corresponding commands. In the next chapter, I report first the unadjusted results and after them the autocorrelation-adjusted results. Thorough discussion about the interpretation and differences of the results is presented in the chapters 4 and 5.

4. Empirical Results

This chapter presents the empirical results of my study.

4.1 Stock market returns and macroeconomic fear factors

Table 2 presents the results of the relationship between general stock market returns and the macroeconomic fear factors for the two different time periods (36 and 60-month periods). I measure the general stock market returns by using the MSCI Europe Total Return Index as a proxy for them. In addition, I also use a self-constructed equally-weighted composite index of a sample of passively managed index funds that invest in European stocks. This composite index includes all the index funds in the Mutual Fund Report that invest in European stocks but excludes the index funds that invest only in the euro area. All the returns are measured net of fees.

The results indicate that three-year stock market returns in the time period of 1998–2000 have been significantly better when the level of macroeconomic fear in the beginning of the period has been high. Vice versa, the stock market returns have been significantly lower in the periods that precede a high level of sentiment and low level of fear.

Compared to three-year periods similar results regarding the relationship can be seen in observing five-year periods. However, there are some differences. Firstly, the statistical significance of Bull-Bear Spread, CBOE Volatility Index, ESI, EURO HY OAS Spread and Recession month is substantially higher in five-year periods. On the other hand the significance of the two multi-factor sentiment indexes constructed by scholars, BW and HJTZ Sentiment Index is now lower but the third sentiment index that takes several factors into account – ESI – is now higher. This result can be interpreted in a way that these two multi-factor sentiment indexes before are more suitable in predicting stock returns in the short term whereas the other five measures are better during the longer time-horizons. The unadjusted results presented in the both tables support the previous academic findings that stock market returns can be predicted by using the information of the macroeconomic sentiment measures.

Table 2. Unadjusted Results of Stock Market Returns

MSCI Europe Total Return is the average monthly return of the underlying benchmark index. Index Fund Portfolio is the average net-return of all passively managed equity mutual funds and ETFs that invest in European stocks. Net-Return (all funds) is the average return of all the actively managed funds in my sample that invest in European stocks. The explanatory variables in the first column are defined under the section 3.3. Explanatory variables.

3-year period	Monthly coefficients and t-statistics	
	MSCI Europe Total Return	*Index Fund Portfolio Total Return*
Bull-Bear Spread	-1.07**	-0.79*
	-2.41	*-1.73*
CBOE Volatility Index (VIX)	0.02**	0.02**
	2.48	*2.40*
Economic Sentiment Index (ESI)	-0.06***	-0.06***
	-10.42	*-9.53*
EURO HY OAS Spread	0.04**	0.04**
	2.21	*2.04*
Recession month	0.96***	0.85***
	4.95	*3.94*
BW Sentiment Index	-1.01***	-1.00***
	-11.06	*-10.45*
HJTZ Sentiment Index	-0.55***	-0.56***
	-7.88	*-7.83*
5-year period		
Bull-Bear Spread	-2.23***	-1.90***
	-5.30	*4.55*
CBOE Volatility Index (VIX)	0.05***	0.05***
	6.56	*7.26*
Economic Sentiment Index (ESI)	-0.08***	-0.07***
	-16.91	*-16.58*
EURO HY OAS Spread	0.13***	0.13***
	8.65	*9.59*
Recession month	1.68***	1.51***
	7.48	*6.70*
BW Sentiment Index	-0.55***	-0.50***
	-4.92	*-4.51*
HJTZ Sentiment Index	-0.10	-0.08
	-1.25	*-1.05*

Note: The coefficients are percentages (e.g. 1.00 = 1%)
Statistical significance: * < 10%, ** < 5%, *** < 1%

4.2 Fund performance and macroeconomic fear factors

Table 3 presents the empirical results of the relationship between fund performance and macroeconomic fear factors for the two different time periods (36 and 60-month periods). The majority of the results obtained in three-year periods support the proposed relationship. The result is strongest in using the Fama-French three-factor model to adjust risk which produces statistically significant results for all of the seven independent variables. Also the direction of the effect is in line with the hypotheses 1–7. Thus, even though all of the risk-adjustment models do not produce a result that I expected, still I can argue that the hypotheses 1–7 can be accepted with a reasonable level of statistical reliability.

Out of the seven explanatory variables, BW Sentiment Index and quite surprisingly CBOE Volatility Index (VIX) yield statistically the most significant results. Also, there is only one explanatory variable – Economic Sentiment Index (ESI) – which yields a significant result for all four risk-adjustment methods.

Based on how these seven explanatory variables are constructed, BW and HJTZ Sentiment Indexes are academically the most robust. As it can be seen in the Table 3 they are especially powerful predictors of risk-adjusted returns when the fund performance is measured by using a basic CAPM alpha i.e. the “Jensen´s measure”. However, when a more sophisticated risk-adjustment method is applied then the relationship fades. There is still a significant relation in Fama-French alpha and BW Sentiment Index, but the relationship between fund performance and BW or HJTZ Sentiment Index disappears when the Carhart´s four-factor model is used to adjust risk.

Table 3. Unadjusted Results of Fund Performance

The explanatory variables in the first column are defined under the section 3.3. Explanatory variables. Benchmark-adjusted return, CAPM Alpha, Fama-French Alpha and Carhart´s 4-factor Alpha are the corresponding risk-adjusted monthly returns of all the actively managed equity mutual funds in my sample that invest in European stocks. The results presented in this table have not been adjusted for autocorrelation.

3-year period	Coefficients and t-statistics			
	Benchmark-adjusted return	*CAPM Alpha*	*Fama-French Alpha*	*Carhart´s 4-factor Alpha*
Bull-Bear Spread	0.17	-0.23	-0.53*	-0.55**
	1.59	*-0.74*	*-1.71*	*-2.07*
CBOE Volatility Index (VIX)	0.00**	0.01	0.03***	0.03***
	2.25	*1.65*	*5.24*	*5.90*
Economic Sentiment Index (ESI)	-0.00**	-0.01***	-0.01*	-0.01*
	-2.48	*-2.75*	*-1.89*	*-1.82*
EURO HY OAS Spread	0.01	-0.02	0.03***	0.04***
	1.21	*-1.31*	*2.81*	*3.92*
Recession month	-0.08	0.40	0.56***	0.38***
	-1.5	*2.59*	*3.82*	*2.93*
BW Sentiment Index	-0.06**	-0.65***	-0.26***	-0.09
	2.11	*-9.51*	*-3.33*	*-1.21*
HJTZ Sentiment Index	-0.06***	-0.38***	-0.10*	-0.25
	-2.95	*-7.62*	*-1.77*	*-0.34*
5-year period				
Bull-Bear Spread	0.17**	-0.55***	-0.28	-0.10
	2.43	*-3.77*	*-1.36*	*-0.43*
CBOE Volatility Index (VIX)	0.00***	0.01***	0.02***	0.02***
	3.13	*3.71*	*5.10*	*4.99*
Economic Sentiment Index (ESI)	-0.00	-0.01***	-0.00	0.00
	-1.16	*-5.77*	*-0.53*	*0.60*
EURO HY OAS Spread	0.01***	0.01*	0.03***	0.03***
	4.76	*1.71*	*3.26*	*3.20*
Recession month	-0.11***	0.41***	0.39***	0.25*
	-2.75	*5.03*	*3.36*	*1.90*
BW Sentiment Index	0.07***	-0.27***	-0.00	0.07
	3.93	*-8.24*	*-0.00*	*1.22*
HJTZ Sentiment Index	0.02	-0.13***	0.07*	0.10**
	1.64	*-5.17*	*1.84*	*2.56*

Note: The coefficients are percentages (e.g. 1.00 = 1%)
Statistical significance: * < 10%, ** < 5%, *** < 1%

Like in the three-year periods also the analysis of five-year periods support the proposed relationship between mutual fund performance and macroeconomic fear factors. Like it is the case regarding three-year periods, also in this case all the tests do not produce statistically significant result. However, there are a few differences between these two groups of results.

Firstly, the results regarding the benchmark-adjusted return in the case of CBOE volatility Index and BW and HJTZ Sentiment Indexes are counterintuitive, because the relationship is positive. However, the level of estimated coefficient in the case of VIX and HJTZ Sentiment Index is so close to zero that it can reasonably be said that their economic significance is non-existent.

Secondly, compared to 3-year period results where Fama-French three-factor model yields a statistically significant relationship for all of the seven explanatory variables, now this model is not as effective. The interpretation in general is that the proposed relationship between fund performance and macroeconomic fear factors holds better in relatively shorter time periods. My reasoning is that any five-year period in the financial markets is after all so long time that many other things that affect on asset prices can surpass the effect of sentiment in the beginning of the measurement period and therefore have a more significant impact on fund performance.

4.3 Summary of stock market returns and fund performance

A. Stock market returns

To conclude the analysis regarding the non-autocorrelation-adjusted relationship between stock market returns and the level of macroeconomic fear factors, it can be said that investors are better off in investing in times of high uncertainty and low sentiment. This result supports the findings of Baker and Wurgler (2006) as well as Huang, Jiang, Tu and Zhou (2015). Also, it seems to be that these more complicated multi-factor sentiment indexes of the above scholars as well as the Economic Sentiment Index (ESI) which also takes several factors into account are more powerful predictors of stock returns especially in the short-term (36-month periods). Statistical significance of these three economic sentiment indicators is much higher compared to other variables in the Table 2. An obvious recommendation for stock investors is therefore to prefer these more complicated sentiment indexes when they are concerning their investment and asset allocation decisions in the short-term.

There is also evidence to support the assumption that American sentiment proxies like Bull-Bear Spread compiled by the American Association of Individual Investors (AAII) and CBOE Volatility Index (VIX) which measures the implied volatility of S&P 500 index can be used to predict stock returns in European markets. One reason for this finding can be the high correlation between European and American stocks during the period of 1998–2015. Another factor that makes the application of American sentiment indexes more useful is a fact that the correlation between the returns of these two market areas is not constant over time and it tends to increase in times of high global macroeconomic uncertainty. For example Longin and Solnik (1995) have found that the underlying correlation rises in the period of high volatility.

B. Mutual fund performance

What comes to fund performance, investors who participate in the stock market by holding actively managed equity mutual funds benefit not only with a higher expected net-return but also with a relatively higher expected risk-adjusted net-return when they invest in times of high uncertainty and low sentiment. This result supports the findings of Moskowitz (2000) and Kosowski (2011) who found that actively managed equity mutual funds outperform in times of above average uncertainty. Also the findings provide support for the results of Avramov, Kosowski, Naik, and Teo (2011) in the hedge fund context. In my analysis, the relationship between fund performance and these macroeconomic fear factors is not as robust as with simple stock returns but still the results support this phenomenon. Autocorrelation-adjusted results are presented in the next section.

The bad news to fund investors is that even though there seems to be a relationship between sentiment and fund performance, changes in the level of sentiment are still difficult to predict. This means that by increasing equity fund holdings when sentiment is low does not mean that sentiment cannot go even lower in the near future. For example Barberis, Shleifer and Vishny (1998) as well as Long et al. (1990a) have found that changes in investor sentiment are in the short-term difficult to predict which sets limits to arbitrage the mispricing that results in high risk-adjusted returns.

4.4 Results adjusted for autocorrelation in the error term

A. Stock market returns

Tables 4 and 5 present the relationship between stock returns and macroeconomic fear factors by using Newey-West standard errors and Cochrane-Orcutt estimation procedures. The lag length of 5 in Newey-West standard error calculations is chosen because it equals an optimal lag length based on the derivation of Andrews (1991).[26] Generally speaking the lag length should be higher when autocorrelation is higher but based on my own calculations using Stata, increasing the lag length above 5 does not have a material effect on the results in this study. As the lag length increases also the standard error of the coefficient of an explanatory variable increases but with a diminishing pace. The lag length does not have an effect on the value of beta coefficient itself, only on its statistical significance.

As can be seen in the tables 4 and 5, there is strong evidence that macroeconomic fear factors can predict subsequent stock market returns even after correcting autocorrelation. This finding supports the previous findings presented earlier. However, the results presented above are not completely conclusive because there does not exist a statistically significant relationship in all the variables, time periods and autocorrelation adjustment methods. It seems to be that quite surprisingly Economic Sentiment Index (ESI) constructed by Eurostat is the best predictor of future stock returns in the short term. This is interesting because ESI does not explicitly measure investor sentiment at all. On the other hand, an economic significance of the result is not that large on average. Depending on the time period and adjustment method, ESI has a negative effect of about 0.03%–0.07% on the monthly return of the benchmark index. This means that if ESI decreases for example 10 points from 100 to 90 which is a material drop in economic sentiment, the expected annual return during the next 3–5 years is predicted to be about 3.66%–8.73% better. In general the statistical significance of the results decreases substantially compared to non-autocorrelation adjusted results presented earlier in this chapter. This is not unusual because the underlying adjustment methods traditionally produce much higher standard errors compared to an unadjusted simple linear OLS regression model (Woolridge, 2009).

[26] I have estimated the lag length $m \approx CT^{1/3}$, where $C = 1.4$ and T is either 36 or 60 depending on the time period.

Table 4. Results of Stock Market Returns by using Newey-West standard errors

MSCI Europe Total Return is the average monthly return of the underlying benchmark index. Index Fund Portfolio is the average net-return of all passively managed equity mutual funds and ETFs that invest in European stocks. Net-Return (all funds) is the average return of all the actively managed funds in my sample that invest in European stocks. The explanatory variables in the first column are defined under the section 3.3. Explanatory variables. The results presented in this table have been adjusted for autocorrelation by using Newey-West standard errors.

3-year period	Coefficients and t-statistics by using Newey-West standard errors (lag = 5)	
	MSCI Europe Total Return	*Index Fund Portfolio Total Return*
Bull-Bear Spread	-1.07	-0.79
	-1.22	*-0.87*
CBOE Volatility Index	0.02*	0.02
	1.70	*1.60*
Economic Sentiment Index (ESI)	-0.06***	-0.06***
	-4.27	*-3.86*
EURO HY OAS Spread	0.04	0.04
	1.24	*1.15*
Recession month	0.96***	0.85
	4.32	*3.62*
BW Sentiment Index	-1.01***	-1.00***
	-4.71	*-4.59*
HJTZ Sentiment Index	-0.55***	-0.56***
	-3.89	*-3.89*
5-year period		
Bull-Bear Spread	-2.22***	-1.90***
	-3.26	*-2.77*
CBOE Volatility Index	0.05***	0.05***
	4.95	*5.18*
Economic Sentiment Index (ESI)	-0.08***	-0.07***
	-9.30	*-8.11*
EURO HY OAS Spread	0.13***	0.13***
	7.08	*7.73*
Recession month	1.68***	1.51***
	7.52	*6.57*
BW Sentiment Index	-0.55**	-0.50**
	-2.24	*-1.99*
HJTZ Sentiment Index	-0.10	-0.08
	-0.70	*-0.57*

Note: The coefficients are percentages (e.g. 1.00 = 1%)
Statistical significance: * = 10%, ** = 5%, *** = 1%

Table 5. Results of Stock Market Returns by using Cochrane-Orcutt-procedure

MSCI Europe Total Return is the average monthly return of the underlying benchmark index. Index Fund Portfolio is the average net-return of all passively managed equity mutual funds and ETFs that invest in European stocks. Net-Return (all funds) is the average return of all the actively managed funds in my sample that invest in European stocks. The explanatory variables in the first column are defined under the section 3.3. Explanatory variables. The results presented in this table have been adjusted for autocorrelation by using Cochrane-Orcutt estimation procedure.

3-year period	Coefficients and t-statistics by using Cochrane-Orcutt procedure	
	MSCI Europe Total Return	*Index Fund Portfolio Total Return*
Bull-Bear Spread	-0.34***	-0.34***
	-3.65	*-3.41*
CBOE Volatility Index	0.02***	0.02***
	6.19	*6.32*
Economic Sentiment Index (ESI)	-0.03***	-0.03***
	-4.33	*4.28*
EURO HY OAS Spread	0.05***	0.05***
	3.70	*3.60*
Recession month	0.16	0.19
	1.35	*1.57*
BW Sentiment Index	-0.09	-0.10
	-0.87	*-0.86*
HJTZ Sentiment Index	-0.04	-0.05
	-0.46	*-0.67*
5-year period		
Bull-Bear Spread	-0.34***	-0.33***
	-3.54	*-3.26*
CBOE Volatility Index	0.02***	0.02***
	6.47	*6.68*
Economic Sentiment Index (ESI)	-0.03***	-0.03***
	-4.35	*-4.43*
EURO HY OAS Spread	0.06***	0.06***
	4.54	*4.61*
Recession month	0.08	0.12
	0.60	*0.87*
BW Sentiment Index	0.04	0.03
	0.43	*0.26*
HJTZ Sentiment Index	0.07	0.06
	1.02	*0.78*

Note: The coefficients are percentages (e.g. 1.00 = 1%)

Statistical significance: * = 10%, ** = 5%, *** = 1%

B. Mutual fund performance

Table 6. Results of Fund Performance (Newey-West standard errors)

The explanatory variables in the first column are defined under the section 3.3. Explanatory variables. Benchmark-adjusted return, CAPM Alpha, Fama-French Alpha and Carhart´s 4-factor Alpha are the corresponding risk-adjusted monthly returns of all the actively managed equity mutual funds in my sample that invest in European stocks. The results presented in this table have been adjusted for auto-correlation by using Newey-West standard errors.

3-year period	Coefficients and t-statistics by using Newey-West standard errors (lag = 5)			
	Benchmark-adjusted return	*CAPM Alpha*	*Fama-French Alpha*	*Carhart´s 4-factor Alpha*
Bull-Bear Spread	0.17	-0.23	-0.53	-0.55
	0.88	*-0.51*	*-1.43*	*-1.38*
CBOE Volatility Index	0.00	0.01	0.03***	0.03***
	1.27	*1.19*	*2.72*	*3.14*
Economic Sentiment Index (ESI)	-0.00	-0.01	-0.01	-0.01
	-1.28	*-1.40*	*-1.14*	*-1.34*
EURO HY OAS Spread	0.01	-0.02	0.03*	0.04**
	0.70	*-0.70*	*1.81*	*2.47*
Recession month	-0.01	0.40**	0.56***	0.38**
	-1.49	*2.20*	*3.35*	*2.23*
BW Sentiment Index	-0.06	-0.65***	-0.26***	-0.08
	-1.23	*-8.67*	*-3.15*	*-1.06*
HJTZ Sentiment Index	-0.06	-0.38***	-0.10	0.03
	-1.62	*-5.72*	*-1.30*	*0.35*
5-year period				
Bull-Bear Spread	0.17*	-0.55***	-0.28	-0.10
	1.86	*-2.62*	*-0.98*	*-0.31*
CBOE Volatility Index	0.00	0.01***	0.02***	0.02***
	1.51	*3.44*	*2.98*	*2.70*
Economic Sentiment Index (ESI)	-0.00	-0.01***	-0.00	0.00
	-0.56	*-3.29*	*-0.28*	*0.32*
EURO HY OAS Spread	0.01*	0.01	0.03**	0.03***
	1.67	*0.88*	*2.44*	*2.74*
Recession month	-0.11**	0.41***	0.39***	0.25**
	-2.56	*6.64*	*4.29*	*2.23*
BW Sentiment Index	0.07*	-0.27***	-0.00	0.07
	2.24	*-5.59*	*-0.00*	*0.87*
HJTZ Sentiment Index	0.02	-0.13***	0.07	0.10*
	0.83	*-2.94*	*1.24*	*1.86*

Note: The coefficients are percentages (e.g. 1.00 = 1%)
Statistical significance: * = 10%, ** = 5%, *** = 1%

Table 7. Results of Fund Performance (Cochrane-Orcutt)

The explanatory variables in the first column are defined under the section 3.3. Explanatory variables. Benchmark-adjusted return, CAPM Alpha, Fama-French Alpha and Carhart´s 4-factor Alpha are the corresponding risk-adjusted monthly returns of all the actively managed equity mutual funds in my sample that invest in European stocks. The results presented in this table have been adjusted for auto-correlation by using Cochrane-Orcutt estimation procedure.

3-year period	Coefficients and t-statistics by using Cochrane-Orcutt estimation procedure			
	Benchmark-adjusted return	*CAPM Alpha*	*Fama-French Alpha*	*Carhart´s 4-factor Alpha*
Bull-Bear Spread	-0.01	-0.17***	-0.13**	-0.02
	-0.46	*-2.73*	*-1.94*	*-0.17*
CBOE Volatility Index	0.003***	0.01***	0.01***	0.01
	3.23	*3.03*	*3.19*	*1.56*
Economic Sentiment Index (ESI)	-0.00	-0.01*	-0.01**	-0.01
	-1.58	*-1.85*	*-2.11*	*-1.45*
EURO HY OAS Spread	0.01**	0.02**	0.03***	-0.00
	2.31	*2.08*	*3.13*	*-0.06*
Recession month	0.01*	0.01	0.09	-0.01
	1.68	*0.69*	*1.21*	*-0.65*
BW Sentiment Index	-0.02	-0.12*	-0.09	-0.05
	-0.63	*-1.73*	*-1.21*	*-0.49*
HJTZ Sentiment Index	-0.03	-0.09*	-0.07	-0.09
	-1.30	*-1.72*	*-1.38*	*-1.31*
5-year period				
Bull-Bear Spread	-0.00	-0.07*	-0.04	-0.03
	-0.03	*-1.88*	*-0.97*	*-0.64*
CBOE Volatility Index	0.00***	0.00***	0.00***	0.01***
	3.56	*3.11*	*3.49*	*3.04*
Economic Sentiment Index (ESI)	-0.00***	-0.01***	-0.01***	-0.01**
	-2.46	*-2.75*	*-2.46*	*-2.20*
EURO HY OAS Spread	0.01***	0.02***	0.02***	0.03***
	4.14	*3.50*	*4.00*	*4.07*
Recession month	0.06**	-0.00	0.03	0.04
	2.37	*-0.09*	*0.55*	*0.58*
BW Sentiment Index	0.01	0.02	0.04	0.08
	0.30	*0.62*	*0.97*	*1.51*
HJTZ Sentiment Index	0.00	-0.01	-0.02	0.00
	0.17	*-0.41*	*-0.51*	*0.05*

Note: The coefficients are percentages (e.g. 1.00 = 1%)
Statistical significance: * = 10%, ** = 5%, *** = 1%

Tables 6 and 7 show that there is evidence that supports my hypothesis that risk-adjusted returns of mutual funds and macroeconomic fear factors have a statistically significant relationship. However, as can be seen the underlying relationship does not hold regarding all of the explanatory variables and risk-adjustment methods so the results are not completely conclusive. In addition, the relationship holds better in shorter time periods. The economic significance of the 5-year results is also generally lower than in the 3-year results. This on the other hand supports the finding presented earlier that in the long-term there are other factors (e.g. management costs combined with a lack of activity) that have a more severe impact on a fund´s performance. But obviously it is also a statistical fact if the majority of the possible outperformance is generated in the early years of a measurement period and it is then divided into a longer time period, the average monthly outperformance is going to be lower.

B.1 3-year results

In the 3-year periods and using the Cochrane-Orcutt estimation procedure, it is notable that Carhart´s four-factor alpha is not statistically significant in any of the explanatory variables. Also the economic significance of many of the results is low. For example two of the most statistically significant variables in the 3-year periods, CBOE Volatility Index and ESI, have beta coefficients of 0.01% and -0.01%, respectively. This means that there have to be a material drop in economic sentiment or a spike in implied volatility in order that to be shown in risk-adjusted return of an average mutual fund. For example, during the time period of January 1998 to December 2015 the Economic Sentiment Index (ESI) varied between values of 66.5 and 117.2 and having an average value of 101.4 and a standard deviation of 10.2. I interpret the result in a way that if ESI suddenly drops by an amount of its standard deviation, this 10.2 point drop would then be associated with about 1.2% increase in the annual risk-adjusted return during the next 3-year-period measured by Carhart´s Alpha. The underlying effect is approximately in the same level for these two variables (VIX and ESI) if the mutual fund performance is measured by using a simple CAPM alpha or a Fama-French alpha. The only difference is then that the statistical difference is higher. For VIX t-statistics are 3.03 and 3.19 and for ESI they are -1.85 and -2.11, respectively.

In the 3-year periods and using Newey-West standard errors, the results are slightly different. In the Table 13 it can be observed that now there are three significant results regarding Carhart´s four-factor alpha. Besides VIX and ESI also the recession month variable yields a significant result of 0.38% in a month. The estimated coefficient of ESI is the same -0.01% compared to

Cochrane-Orcutt estimation but VIX´s coefficient is higher (0.03% compared to 0.01%). By using Newey-West standard errors I also observed a significant relationship between Fama-French alpha and BW Sentiment Index. This result indicates that the underlying index is not only a powerful predictor of stock returns but also mutual fund performance. Low values (i.e. low investor sentiment) of the BW Sentiment Index are associated with relatively higher Fama-French alphas during the subsequent 3-year periods (monthly beta coefficient = -0.26% and the corresponding t-statistic = -3.15).

B.2 5-year results

In the 5-year periods I found generally similar results with both of the autocorrelation adjustment methods compared to 3-year periods. One major difference however is that the estimated slope coefficients are slightly closer to zero which means that the proposed relationship between macroeconomic fear factors and fund performance is not that strong in longer time periods. This makes intuitionally sense due to the same reasons as presented regarding the analysis of the same relationship but with stock returns. Another major difference in the 5-year periods is that the significant relationship between Fama-French alpha and the BW Sentiment Index disappears (monthly beta coefficient = -0.00% and t-statistic = -0.00).

As a summary regarding this section, the conclusion concerning the relationship between macroeconomic fear factors and mutual fund performance, it greatly depends on the used risk-adjustment method and the explanatory variable. But still, as the results above indicate this study provides strong evidence in favor of the proposed relationship.

4.5 Comparison between five equal-size subsets

In this section I present the results in a different way by dividing the findings of each independent variable except recession month (which is a dummy variable) and fund performance measure to five equal-size subsets i.e. quintiles for both time periods based on the level of an independent variable.[27] In other words, I sort the average monthly mutual fund performance measures by the level of a corresponding macroeconomic fear factor in the beginning of the measurement period. This will yield five equal-size groups of findings from a low value of a fear factor to a high value of a fear factor. Tables 11 to 22 in the appendix present these results for each of the variables separately. The table 8 below presents the summary of them.

[27] Baker and Wurgler (2006) conduct a same kind of analysis but in a different way in their study.

Table 8. Summary of the comparison between the lowest and highest quintiles

The explanatory variables in the first column are defined under the section 3.3. Explanatory variables. Benchmark-adjusted return, CAPM Alpha, Fama-French Alpha and Carhart´s 4-factor Alpha are the corresponding risk-adjusted monthly returns of all the actively managed equity mutual funds in my sample that invest in European stocks. The upper figure on each row represents the difference between the quintiles 1 and 5. The quintile 1 is the low value and the quintile five is the high value of the corresponding explanatory factor. The lower figure on each row represents the t-statistic of the underlying difference. Full results of this table are reported in the appendix separately for each variable.

3-year period	Difference of means between Quintiles 1 (low value) and 5 (high value) and its t-statistic			
	Benchmark-adjusted return	*CAPM Alpha*	*Fama-French Alpha*	*Carhart´s 4-factor Alpha*
Bull-Bear Spread	-0.09*	0.20	0.35**	0.36***
	-1.49	*1.22*	*2.25*	*2.64*
CBOE Volatility Index	-0.18***	-0.47***	-0.93***	-0.89***
	-3.27	*-3.49*	*-7.79*	*-9.01*
Economic Sentiment Index (ESI)	0.14***	0.52***	0.30**	0.23**
	2.76	*2.90*	*2.04*	*2.33*
EURO HY OAS Spread	-0.14***	0.27**	-0.38***	-0.53***
	-2.68	*2.31*	*-4.58*	*-7.44*
BW Sentiment Index	0.19***	1.24***	0.55***	0.13
	3.97	*12.90*	*5.99*	*1.46*
HJTZ Sentiment Index	-0.08***	0.66***	0.10	-0.12
	-2.74	*5.26*	*0.83*	*-1.11*
5-year period				
Bull-Bear Spread	-0.08**	0.28***	0.18*	0.11
	-2.33	*3.82*	*1.66*	*0.88*
CBOE Volatility Index	-0.15***	-0.24***	-0.42***	-0.47***
	-4.75	*-3.77*	*-4.31*	*-4.33*
Economic Sentiment Index (ESI)	0.07**	0.35***	-0.06	-0.18**
	2.01	*4.06*	*-0.56*	*-1.74*
EURO HY OAS Spread	-0.21***	-0.07	-0.27***	-0.31***
	-6.32	*-1.01*	*-4.69*	*-6.67*
BW Sentiment Index	-0.09***	0.55***	0.01	-0.16**
	-2.42	*10.04*	*0.16*	*-1.81*
HJTZ Sentiment Index	-0.11***	0.17***	-0.38***	-0.48***
	-3.28	*2.46*	*-6.71*	*-9.20*

Note: The coefficients are percentages (e.g. 1.00 = 1%)
Statistical significance: * = 10%, ** = 5%, *** = 1%

In general, the results obtained from the analysis of comparing the quintiles with each other support the notion that the relationship between fund performance and macroeconomic fear factors is driven by extreme observations and market environments. In other words, in many cases there does not seem to be much difference in historical fund performance when the level of macroeconomic fear in the beginning of the measurement period is close a long-term average level whether the level of a given explanatory variable is above or below the average. This result holds regarding Bull-Bear Spread in both time periods and at least in one of the time periods regarding CBOE Volatility Index, Economic Sentiment Index and BW Sentiment Index.

However, regarding all the six explanatory variables and both time periods (36 and 60-month periods) there is a significant difference between the quintiles 1 and 5 i.e. the group of performance that precedes a low value of an explanatory variable and the group that precedes a high value of an explanatory variable. The difference is not statistically significant regarding all of the risk-adjustment methods and in a few cases the sign of the difference is unexpected but still, this finding can be generalized to a substantial majority of the results though. I can therefore conclude that my study produces evidence that macroeconomic fear factors and subsequent mutual fund performance have a positive correlation.

The finding of the comparisons between the groups of results can be also interpreted in a way that the proposed relationship between fund performance and macroeconomic fear factors is not linear all the time. If this is true, one explanation can be obtained from the results of Barberis, Shleifer and Vishny (1998). They found that investors are prone to overreact when a series of unexpectedly bad or good news occur. This means that for example when a series a bad news hit the markets and the investor sentiment falls, investors extrapolate that this new environment is here to stay which leads to mispricing of stocks and on the other hand can increase the risk-adjusted return of a mutual fund if a manger can exploit the mispricing. The effect is the same but to another direction when a series of unexpectedly good news occur. Before Barberis et. al (1998), Fama (1991) who refer to De Bondt and Thaler (1985, 1987) have noted a possibility of “market overreaction to extreme (i.e. unexpected and dramatic) bad or good news”.

In the next chapter I continue the discussion of the results presented in this chapter.

5. Discussion

In this chapter I continue the analysis and interpretation of the results presented in the previous chapter. This chapter has been divided into seven subsections (one for each of the seven testable hypothesis).

H1: Economic Sentiment Index (ESI)

ESI has a strong predictive power in future stock returns. Low values of ESI are associated with relatively higher subsequent stock returns during the three and five-year periods. This result supports the finding of Fisher and Statman (2003) who stated that consumer confidence (which is one of the five components in ESI) can predict some stock returns (but not S&P 500).

ESI has also some predictive power in future risk-adjusted returns of mutual funds but the economic significance of this result is debatable. The difference in monthly alphas between the lowest and highest quintiles is about 0.23% - 0.52% during three-year periods and the difference is statistically significant. This study therefore increases the current knowledge about the relationship between economic sentiment and mutual fund alpha predictability. To the best of my knowledge this study is the first one to show that there is some evidence for the negative relationship between Economic Sentiment Index (ESI) and risk-adjusted returns of European equity mutual funds. Low values of ESI are associated with relatively higher alphas during the subsequent three-year periods. However, during five-year periods this correlation is not that robust.

H2: CBOE volatility index (VIX)

VIX has a strong predictive power in future returns of European stocks especially during the five-year periods. During shorter time periods VIX does not yield as robust results as ESI does when Newey-West standard errors are used.

High values of VIX are also associated with relatively higher future risk-adjusted returns of mutual funds but like regarding ESI the economic significance of this result is debatable. The difference in alphas between high and low quintiles is approximately 0.24% - 0.93% per month during the next three and five-year periods and the difference is statistically significant at 1% level. This result supports the finding of Paul (2009) and Kosowski (2011) who showed that the average alpha of actively managed equity mutual funds is time-varying and correlates with volatility and return dispersion. Avramov, Kosowski, Naik, and Teo (2011) have also made a similar conclusion in the hedge fund context. Therefore I can say that the result of my study reinforces and validates the previous findings that have been conducted with purely American and pre-euro-crisis data.

H3: EURO HY OAS Spread (Credit spread)

Credit spread has a strong predictive power in stock market returns especially during the five-year periods. During three-year periods the relationship holds well if Cochrane-Orcutt procedure is used.

Credit spread is also suitable in predicting future alpha of mutual funds in three-year periods. I found that one percentage point increase in credit spread is associated with statistically significant 0.03% increase in monthly Fama-French alpha and 0.04% increase in Carhart´s alpha if Newey-West standard errors are used. In addition the monthly difference between the lowest and highest quintiles varies between -0.27% and -0.53% during three and five-year periods for Fama-French and Carhart´s alpha. Thus, small credit spreads are associated with relatively lower subsequent multi-factor alphas and vice versa. This finding supports and validates the results of Avramov (2004) and Avramov and Wermers (2006) who found that business cycle variables like credit default spreads can predict performance of actively managed equity mutual funds.

H4: Investor sentiment measured by AAII´s Bull-Bear-spread

An interpretation of the results regarding the predictive power of Bull-Bear spread with respect to stock returns in Europe is similar compared to credit spread. Bull-Bear spread has a strong predictive power in stock market returns especially during the five-year periods. During three-year periods the relationship holds well if Cochrane-Orcutt procedure is used. This result is in line with the findings of Fisher and Statman (2000) who concluded that investor sentiment can be useful for tactical asset allocation because it has a negative relationship with future stock returns in the short-term. One of the measures that the scholars used was the same Bull-Bear spread compiled by AAII.

Unfortunately the Bull-Bear spread does not have much predictive power in risk-adjusted mutual fund performance especially when multi-factor models are used. However, the evidence that I obtained in my analysis is still in favor of a negative relationship between mutual fund performance and investor sentiment measured by Bull-Bear spread.

H5: The sentiment index of Huang, Jiang, Tu and Zhou (HJTZ Sentiment Index)

HJTZ Sentiment Index is unexpectedly quite poor predictor of European stock returns. Only statistically significant result is obtained in the Table 11 (Newey-West standard errors and 3-year measurement periods). The evidence there supports the notion of negative correlation with investor sentiment and future stock returns but in general the results are inconclusive and mixed.

Also the effect of HJTZ on mutual fund performance provides mixed results. One explanation is that the HJTZ is not a suitable measure to be used in a European context (or it should be constructed by using solely European data) and therefore other more Europe specific measures should be used as a proxy for macroeconomic fear. Another interpretation is that investor sentiment as such and when measured correctly cannot be used to predict mutual fund performance but only stock returns in some settings. However, because of the noise in the results I just conclude that evidence regarding the relationship between HJTZ Sentiment Index and future mutual fund performance is mixed.

H6: The sentiment index of Baker and Wurgler (BW Sentiment Index)

BW Sentiment Index is s suitable predictor of European stock returns in both three and five-year measurement periods when Newey-West standard errors are used. Cochrane-Orcutt estimation procedure does not yield significant results. This evidence supports the findings of Baker and Wurgler (2006) who found in their analysis regarding cross-section of stock returns that low sentiment in the beginning of the measurement period is associated with relatively higher subsequent returns and vice versa. The result is also in line with some other findings in the field of investor sentiment and stock returns like Stambaugh, Yu and Yuan (2012), Baker, Wurgler and Yuan (2012) with international evidence and Brown and Cliff (2005) with longer time periods.

BW Sentiment Index provides also some evidence in favour of a negative correlation between investor sentiment and mutual fund alpha. The relationship is especially strong in three-year time periods and by using Newey-West standard errors. BW Sentiment Index has a statistically significant negative relationship with CAPM alpha and Fama-French alpha (Table 11) but no relationship with Carhart´s four-factor alpha. The result concerning this explanatory variable as a proxy for macroeconomic fear is therefore partly inconclusive. The monthly difference between the low and high quintiles during three-year periods is 1.24% and 0.55% for CAPM and Fama-French alphas respectively and the difference is statistically significant at 1% level. The above results mean that a high level of investor sentiment is associated with low future stock returns and relatively lower risk-adjusted performance of an average European actively managed equity mutual fund measured by the CAPM and the Fama-French three-factor model . The results presented in the Table 27 show that future risk-adjusted performance (CAPM and FF alpha) of the average mutual fund is expected to be negative in the periods that are preceded by a value of BW Sentiment Index that belongs to the highest quintile and positive when the corresponding value belongs to the lowest quintile. This finding partly increases the current knowledge about mutual fund alpha predictability and its time-varying nature.

H7: Times of economic recession

Economic recessions in a way that I have defined them are associated with relatively higher future stock returns compared to periods of real GDP growth in both three and five-year measurement periods by using Newey-West standard errors.

In addition economic recessions are associated with monthly alphas (CAPM, Fama-French or Carhart) that are 0.25% to 0.56% higher on a monthly basis compared to periods of economic growth during three and five-year measurement periods. This finding supports the results of for example Moskowitz (2000) and Kosowski (2011) who found that an average active manager is more likely to outperform the market during recessions than at other times. My result therefore increases the current knowledge that outperformance of an actively managed equity mutual fund can be associated also with time periods that are preceded by a recession.

In the next chapter I briefly summarize the key takeaways of my results, present some practical implications of them but I also discuss the limitations and further research ideas of this topic.

6. Conclusion

This chapter summarizes the empirical results of the study and provides practical implications of them in addition with the most notable limitations of the study.

6.1 Research summary

This study provides strong evidence that the level of certain macroeconomic fear factors in the beginning of the holding period can be used to predict future stock market returns in Europe and also to some extent risk-adjusted performance of actively managed equity mutual funds during time periods of three to five years. I found that in general low values of investor or economic sentiment are associated with relatively higher subsequent risk-adjusted performance and vice versa. In addition, high values of common proxies for uncertainty and fear in the financial markets are often related to relatively higher future stock market returns and risk-adjusted returns of actively managed equity mutual funds that invest in European stocks. These results are in line with the previous findings in the field of macroeconomic timing of mutual fund investing and they therefore validate some of the older findings obtained mainly by using American sample data. However, in this study the findings about mutual fund alpha predictability depend on a given explanatory variable as well as an autocorrelation and risk-adjustment method.

In general, when risk-adjusted performance is measured by using a simple CAPM the results are statistically slightly more significant compared to multi-factor models but the proposed relationship still holds fairly well when Fama-French three-factor model or Carhart´s four-factor model is used. During the time period of January 1998 to December 2015, CAPM explains approximately 60% to 70% of the total cross-sectional variation in net-returns of the average mutual fund on every three to five-year periods. The multi-factor models of Fama and French and Carhart explains generally about 70% to 80% of the total cross-sectional variation depending on the underlying time period. The adjusted R^2s of the simple linear model (5) are generally in a range of 1% to 6% depending on the variable. Only exception is with CBOE Volatility Index when the adjusted R^2 is close to 14%. This means that a substantial majority of a fund´s risk-adjusted performance is explained by other factors than macroeconomic fear.

During the sample period, an average mutual fund was unable to generate statistically significant positive alpha even though the data clearly suffers from self-selection bias. Also during a majority of the individual non-overlapping three-year periods, an average fund was not able to generate significant positive alpha. Both of these observations are in line with previous findings in the field of mutual fund performance research.

6.2 Practical implications

When uncertainty in the financial markets is high and general economic sentiment is low, equity mutual fund investors should not panic. Even though changes in stock prices are difficult to forecast in the short-term, it seems to be that investors who participate in the markets during bad times will be later rewarded. My study suggests that mutual fund investors who increase their holdings during times of high macroeconomic fear will be later rewarded not only with a relatively higher realized net-return but also with a slightly higher risk-adjusted net-return i.e. alpha. One practical recommendation for mutual fund investors who save and invest on a regular basis is that if they have a possibility to increase their investing rate during times of high macroeconomic fear, they should do it if their holding period is adequately long enough.

However, like I have stated in the literature review, there are many other things as well that will have a substantial impact on the long-term performance of a mutual fund. Fund investors who follow the macroeconomic timing strategy in their investment decisions should not forget that an average actively managed fund is prone to underperform. A fund that has high management fees and barely deviates from its benchmark index is unlikely to generate superior performance in the long-term.

In addition, even though the proposed relationship between macroeconomic fear factors and subsequent mutual fund performance would exist in the future, changes in these explanatory factors are still difficult to predict which hinders investors´ ability to achieve superior returns. In other words, if for example investor or economic sentiment is now low there is no guarantee that during the next period it cannot be even lower and correspondingly an investor suffers losses. Like Barberis, Shleifer and Vishny (1998) put it: “An important reason why arbitrage is limited is that movements in investor sentiment are in part unpredictable, and therefore arbitrageurs betting against mispricing run the risk, at least in the short run, that investor sentiment becomes more extreme and prices move even further away from fundamental value”.

As a conclusion even though the economic significance of some of the obtained results is not that substantial, there is still evidence that investing in bad times is a better deal than jumping out from the markets and waiting a storm to calm down. High level of macroeconomic fear correlates with relatively better fund performance in the future.

6.3 Limitations of the study

First major limitation of the study is that the data that I have used is likely to be biased because the database of Investment Research Finland contains only the funds that have allowed the use of their funds in the Mutual Fund Reports. This means that the sample data that I have used contains more funds that have had a relatively better past performance. Also the sample size that I have used could be larger as well. On average from January 1998 to December 2015 I calculated the average mutual fund net-return from 110 individual observations. Thus, if a data sample would be obtained from a large unbiased database there is a chance that the results would differ. In addition if the time period would be extended from the 18 years that I had, it might also have an impact on the results.

Secondly, because I have used several proxies of macroeconomic fear that are based on American data to predict stock market returns and mutual fund performance in European markets, the results might once again change if the underlying explanatory variables would be constructed solely from European data.

Thirdly, the simple linear OLS regression model that I have used contains a high level of positive serial correlation that I have adjusted by using Newey-West standard errors and Cochrane-Orcutt estimation procedure. It is possible that different methods would generate also different results and interpretations of the findings. For example Harri and Brorsen (1998) and Britten-Jones, Neuberger and Nolte (2011) suggest that the use of Newey-West standard errors is not the best way to deal with a problem that arises from overlapping observations[28] that causes a significant positive autocorrelation in the model I use.[29] In addition, to the best of my knowledge the Cochrane-Orcutt estimation procedure that I apply has rarely been used in mutual fund performance research.

6.4 Suggestions for further research

[28] In my model, during any 36 month-period, 35 out of 36 fund return observations overlap. The problem concerning overlapping data is even more inherent during the 5-year period data.

[29] According to Harri and Brorsen (1998) who refer to Hansen and Hodrick (1980),”The overlapping of observations creates a moving average error term and thus ordinary least squares parameter estimates would be inefficient and hypothesis tests biased”.

Different econometrical methods and a larger as well as longer unbiased data could be used in further studies of this topic. For example the sample data that Avramov and Wermers (2006) use contains over 1300 mutual funds during a time period of 28 years. The data was obtained from CRSP. In addition, I have not made any distinction between funds that have different investing objectives. This partition is often done in mutual fund performance research.

Also, other markets and asset classes could be studied as well to validate the findings that I have obtained. It would be also interesting to construct a solely Europe specific proxy for macroeconomic fear that contains information from financial markets and real economy and test how well it can predict stock market returns and mutual fund performance. Some scholars have also used modern methods to measure real-time investor and economic sentiment. For example, Bollen, Mao and Zeng (2011) used information from Twitter and Da, Engelberg and Gao (2015) obtained data from Google Trends to predict stock markets. These same methods could be applied to study whether they can predict risk-adjusted performance of mutual funds as well. In general, the relationship between mutual fund performance and different composite investor sentiment indexes has not gathered so much attention of researchers in the field of macroeconomic timing. One reason for this can be seen in the tables 6 and 7 where statistically significant results with respect to multi-factor risk-adjustment models are difficult to obtain. Because the results regarding this topic are mixed, perhaps more thorough research could shed light on it.

In addition, if the proposed relationship really exists it would be important to know more about how mutual fund investors behave in reality when macroeconomic environment changes. Also the discussion about sources of time-varying fund performance could be continued.[30] Better understanding in this field would help mutual fund investors to make more informed asset allocation and investment decisions which would lead to better results to investors themselves. When people become more aware of how macroeconomic timing affects their investing performance, they might pay more attention to that and avoid some common pitfalls. This is important because mutual fund holdings comprise a material amount of many individuals´ and institutions´ net wealth. Bad decisions in asset allocation and market timing decisions can have such severe consequences that they are later difficult to amend.

[30] An extensive list of possible sources and related articles can be found in Kosowski (2011). However, there does not seem to be a unanimous opinion about validity of these sources among finance scholars.

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Appendix

Table 9. Durbin-Watson d-statistics

The table describes Durbin-Watson d-statistics which represent the level of autocorrelation in the model. These figures have been obtained from Stata as a result of Cochrane-Orcutt estimation procedure. Low values of a Durbin-Watson d-statistic are a sign of positive autocorrelation whereas values close to 2 support the null hypothesis "H0: No autocorrelation". As can be seen in the table, the unadjusted results suffer from statistically significant positive autocorrelation. The 1% critical values have been obtained from Savin and White (1977).

3-year period	Durbin-Watson d-statistics			
	Benchmark-adjusted return	*CAPM Alpha*	*Fama-French Alpha*	*Carhart´s 4-factor Alpha*
Bull-Bear Spread	0.075	0.033	0.045	0.124
CBOE Volatility Index	0.059	0.033	0.064	0.155
Economic Sentiment Index (ESI)	0.062	0.035	0.037	0.103
EURO HY OAS Spread	0.059	0.037	0.037	0.117
Recession month	0.066	0.039	0.049	0.117
BW Sentiment Index	0.062	0.068	0.041	0.103
HJTZ Sentiment Index	0.063	0.054	0.038	0.103
5-year period				
Bull-Bear Spread	0.092	0.109	0.038	0.040
CBOE Volatility Index	0.059	0.056	0.056	0.065
Economic Sentiment Index (ESI)	0.056	0.054	0.030	0.040
EURO HY OAS Spread	0.059	0.044	0.029	0.038
Recession month	0.075	0.078	0.042	0.043
BW Sentiment Index	0.067	0.093	0.030	0.039
HJTZ Sentiment Index	0.058	0.061	0.032	0.043
1% critical values for positive autocorrelation: dL = 1.205 and dU = 1.315				

Table 10. Transformed Durbin-Watson d-statistics

The table describes transformed Durbin-Watson d-statistics which represent the level of autocorrelation in the model. These figures have been obtained from Stata as a result of Cochrane-Orcutt estimation procedure. As can be seen in the table, the Cochrane-Orcutt estimation procedure fully adjusts the autocorrelation in the model. The 1% critical values have been obtained from Savin and White (1977).

3-year period	Durbin-Watson d-statistics (transformed)			
	Benchmark-adjusted return	*CAPM Alpha*	*Fama-French Alpha*	*Carhart´s 4-factor Alpha*
Bull-Bear Spread	1.939	1.655	1.930	2.101
CBOE Volatility Index	1.910	1.621	1.976	2.102
Economic Sentiment Index (ESI)	1.963	1.673	2.020	2.125
EURO HY OAS Spread	1.963	1.628	2.019	2.099
Recession month	1.919	1.656	1.975	2.096
BW Sentiment Index	1.956	1.665	1.963	2.104
HJTZ Sentiment Index	1.954	1.695	1.979	2.130
5-year period				
Bull-Bear Spread	1.836	1.964	1.847	1.826
CBOE Volatility Index	1.852	1.987	1.882	1.887
Economic Sentiment Index (ESI)	1.875	1.953	1.879	1.862
EURO HY OAS Spread	1.910	1.975	1.911	1.912
Recession month	1.799	1.923	1.853	1.826
BW Sentiment Index	1.829	1.918	1.826	1.772
HJTZ Sentiment Index	1.837	1.929	1.847	1.818
1% critical values for positive autocorrelation: dL = 1.205 and dU = 1.315				

Table 11. 3-year period for Bull-Bear Spread

The mean value of the estimated risk-adjusted performance and its standard deviation				
3-year period for Bull-Bear Spread				
Subset	*Benchmark-adjusted return*	*CAPM Alpha*	*Fama-French Alpha*	*Carhart´s 4-factor Alpha*
Quintile 1 (low value)	0.19	0.29	0.26	0.17
	0.21	*0.50*	*0.58*	*0.39*
Quintile 2	0.18	0.06	-0.03	-0.12
	0.22	*0.63*	*0.60*	*0.44*
Quintile 3	0.12	-0.11	-0.13	-0.15
	0.17	*0.63*	*0.64*	*0.59*
Quintile 4	0.20	0.21	0.15	0.07
	0.28	*0.83*	*0.82*	*0.72*
Quintile 5 (high value)	0.28	0.09	-0.09	-0.19
	0.29	*0.86*	*0.74*	*0.72*
Difference of means between Quintiles 1 and 5 and its t-stat	-0.09*	0.20	0.35**	0.36***
	-1.49	*1.22*	*2.25*	*2.64*
ANOVA between all subsets (F-value) and its P-value	2.05*	1.75	2.13*	2.49**
	0.09	*0.14*	*0.08*	*0.05*
ANOVA between Q2, Q3 and Q4 (F-value) and its P-value	1.01	1.88	1.46	1.39
	0.37	*0.16*	*0.24*	*0.25*
Kruskal-Wallis test (H-value) between all subsets	5.17	7.01	13.22***	17.94***
Kruskal-Wallis test (H-value) between Q2, Q3 and Q4	0.89	3.09	1.95	2.18

Note: The coefficients in the return data are percentages (e.g. 1.00 = 1%)
Statistical significance: * < 10%, ** < 5%, *** < 1%

Table 12. 5-year period for Bull-Bear Spread

The mean value of the estimated risk-adjusted performance and its standard deviation				
5-year period for Bull-Bear Spread				
Subset	*Benchmark-adjusted return*	*CAPM Alpha*	*Fama-French Alpha*	*Carhart´s 4-factor Alpha*
Quintile 1 (low value)	0.17	0.12	0.04	0.10
	0.15	*0.26*	*0.45*	*0.47*
Quintile 2	0.19	-0.01	-0.01	0.06
	0.17	*0.31*	*0.40*	*0.43*
Quintile 3	0.17	-0.09	-0.06	0.01
	0.14	*0.32*	*0.34*	*0.34*
Quintile 4	0.25	-0.03	0.09	0.23
	0.14	*0.33*	*0.54*	*0.61*
Quintile 5 (high value)	0.25	-0.16	-0.14	-0.01
	0.12	*0.33*	*0.43*	*0.50*
Difference of means between Quintiles 1 and 5 and its t-stat	-0.08**	0.28***	0.18*	0.11
	-2.33	*3.82*	*1.66*	*0.88*
ANOVA between all subsets (F-value) and its P-value	2.60**	3.64***	1.41	1.25
	0.04	*0.01*	*0.23*	*0.29*
ANOVA between Q2, Q3 and Q4 (F-value) and its P-value	2.41*	0.53	1.04	1.92
	0.10	*0.59*	*0.36*	*0.15*
Kruskal-Wallis test (H-value) between all subsets	10.70***	14.04***	5.14	3.67
Kruskal-Wallis test (H-value) between Q2, Q3 and Q4	4.58	1.36	1.01	1.20
Note: The coefficients in the return data are percentages (e.g. 1.00 = 1%)				
Statistical significance: * < 10%, ** < 5%, *** < 1%				

Table 13. 3-year period for CBOE Volatility index

The mean value of the estimated risk-adjusted performance and its standard deviation				
3-year period for CBOE Volatility index				
Subset	*Benchmark-adjusted return*	*CAPM Alpha*	*Fama-French Alpha*	*Carhart´s 4-factor Alpha*
Quintile 1 (low value)	0.11	-0.21	-0.59	-0.64
	0.23	*0.38*	*0.29*	*0.34*
Quintile 2	0.22	0.30	-0.03	-0.16
	0.28	*0.53*	*0.50*	*0.53*
Quintile 3	0.19	0.13	0.20	0.11
	0.23	*0.88*	*0.71*	*0.47*
Quintile 4	0.17	0.04	0.24	0.22
	0.21	*0.83*	*0.76*	*0.64*
Quintile 5 (high value)	0.29	0.27	0.34	0.25
	0.24	*0.72*	*0.65*	*0.48*
Difference of means between Quintiles 1 and 5 and its t-stat	-0.18***	-0.47***	-0.93***	-0.89***
	-3.27	*-3.49*	*-7.79*	*-9.01*
ANOVA between all subsets (F-value) and its P-value	2.79**	3.12**	13.45***	19.42***
	0.03	*0.02*	*0.00*	*0.00*
ANOVA between Q2, Q3 and Q4 (F-value) and its P-value	0.37	1.08	1.71	4.32
	0.69	*0.34*	*0.19*	*0.02*
Kruskal-Wallis test (H-value) between all subsets	13.10***	18.30***	58.88***	60.64***
Kruskal-Wallis test (H-value) between Q2, Q3 and Q4	0.03	3.39	2.92	4.99
Note: The coefficients in the return data are percentages (e.g. 1.00 = 1%)				
Statistical significance: * < 10%, ** < 5%, *** < 1%				

Table 14. 5-year period for CBOE Volatility index

The mean value of the estimated risk-adjusted performance and its standard deviation				
5-year period for CBOE Volatility index				
Subset	*Benchmark-adjusted return*	*CAPM Alpha*	*Fama-French Alpha*	*Carhart´s 4-factor Alpha*
Quintile 1 (low value)	0.13 *0.10*	-0.13 *0.16*	-0.31 *0.10*	-0.24 *0.10*
Quintile 2	0.21 *0.13*	-0.08 *0.30*	-0.22 *0.36*	-0.13 *0.36*
Quintile 3	0.21 *0.16*	-0.04 *0.39*	0.12 *0.36*	0.21 *0.39*
Quintile 4	0.20 *0.16*	-0.02 *0.35*	0.20 *0.43*	0.31 *0.50*
Quintile 5 (high value)	0.28 *0.15*	0.11 *0.32*	0.12 *0.55*	0.23 *0.61*
Difference of means between Quintiles 1 and 5 and its t-stat	-0.15*** *-4.75*	-0.24*** *-3.77*	-0.42*** *-4.31*	-0.47*** *-4.33*
ANOVA between all subsets (F-value) and its P-value	4.76*** *0.00*	2.66** *0.03*	10.86*** *0.00*	10.19*** *0.00*
ANOVA between Q2, Q3 and Q4 (F-value) and its P-value	0.09 *0.91*	0.29 *0.75*	10.69*** *0.00*	9.43*** *0.00*
Kruskal-Wallis test (H-value) between all subsets	16.26***	9.84**	41.04***	44.43***
Kruskal-Wallis test (H-value) between Q2, Q3 and Q4	0.18	0.69	20.63***	18.64***

Note: The coefficients in the return data are percentages (e.g. 1.00 = 1%)
Statistical significance: * < 10%, ** < 5%, *** < 1%

Table 15. 3-year period for Economic Sentiment Index (ESI)

The mean value of the estimated risk-adjusted performance and its standard deviation				
3-year period for Economic Sentiment Index (ESI)				
Subset	*Benchmark-adjusted return*	*CAPM Alpha*	*Fama-French Alpha*	*Carhart´s 4-factor Alpha*
Quintile 1 (low value)	0.20 *0.19*	0.35 *0.56*	0.31 *0.46*	0.18 *0.39*
Quintile 2	0.29 *0.23*	0.00 *0.59*	-0.20 *0.48*	-0.18 *0.48*
Quintile 3	0.28 *0.25*	0.22 *0.57*	-0.10 *0.71*	-0.10 *0.86*
Quintile 4	0.15 *0.23*	0.13 *0.76*	0.14 *0.86*	-0.07 *0.65*
Quintile 5 (high value)	0.06 *0.24*	-0.17 *0.92*	0.01 *0.75*	-0.06 *0.46*
Difference of means between Quintiles 1 and 5 and its t-stat	0.14*** *2.76*	0.52*** *2.90*	0.30** *2.04*	0.23** *2.33*
ANOVA between all subsets (F-value) and its P-value	6.35*** *0.00*	2.97** *0.02*	3.27** *0.01*	1.80 *0.13*
ANOVA between Q2, Q3 and Q4 (F-value) and its P-value	4.08** *0.02*	1.00 *0.37*	2.32 *0.10*	0.23 *0.80*
Kruskal-Wallis test (H-value) between all subsets	27.89***	19.79***	18.37***	14.78***
Kruskal-Wallis test (H-value) between Q2, Q3 and Q4	8.81**	1.72	2.43	1.14
Note: The coefficients in the return data are percentages (e.g. 1.00 = 1%) Statistical significance: * < 10%, ** < 5%, *** < 1%				

Table 16. 5-year period for Economic Sentiment Index (ESI)

The mean value of the estimated risk-adjusted performance and its standard deviation				
5-year period for Economic Sentiment Index (ESI)				
Subset	*Benchmark-adjusted return*	*CAPM Alpha*	*Fama-French Alpha*	*Carhart´s 4-factor Alpha*
Quintile 1 (low value)	0.22	0.13	-0.02	-0.01
	0.15	*0.27*	*0.43*	*0.40*
Quintile 2	0.26	-0.02	-0.20	-0.13
	0.16	*0.27*	*0.31*	*0.24*
Quintile 3	0.22	0.05	0.06	0.16
	0.12	*0.22*	*0.49*	*0.57*
Quintile 4	0.20	-0.09	0.05	0.19
	0.15	*0.31*	*0.52*	*0.62*
Quintile 5 (high value)	0.14	-0.22	0.03	0.16
	0.14	*0.40*	*0.36*	*0.41*
Difference of means between Quintiles 1 and 5 and its t-stat	0.07**	0.35***	-0.06	-0.18**
	2.01	*4.06*	*-0.56*	*-1.74*
ANOVA between all subsets (F-value) and its P-value	2.73**	6.30***	2.00*	2.77**
	0.03	*0.00*	*0.10*	*0.03*
ANOVA between Q2, Q3 and Q4 (F-value) and its P-value	1.65	2.26	3.40**	3.76**
	0.20	*0.11*	*0.04*	*0.03*
Kruskal-Wallis test (H-value) between all subsets	10.98***	25.01***	7.86	6.25
Kruskal-Wallis test (H-value) between Q2, Q3 and Q4	4.43	7.48	5.11	2.80

Note: The coefficients in the return data are percentages (e.g. 1.00 = 1%)
Statistical significance: * < 10%, ** < 5%, *** < 1%

Table 17. 3-year period for EURO HY OAS Spread

The mean value of the estimated risk-adjusted performance and its standard deviation				
3-year period for EURO HY OAS Spread				
Subset	*Benchmark-adjusted return*	*CAPM Alpha*	*Fama-French Alpha*	*Carhart´s 4-factor Alpha*
Quintile 1 (low value)	0.13	-0.17	-0.57	-0.65
	0.26	*0.38*	*0.19*	*0.31*
Quintile 2	0.25	0.33	-0.01	-0.19
	0.31	*0.68*	*0.67*	*0.51*
Quintile 3	0.15	0.31	0.40	0.38
	0.21	*0.68*	*0.63*	*0.60*
Quintile 4	0.18	0.52	0.52	0.35
	0.23	*0.76*	*0.72*	*0.54*
Quintile 5 (high value)	0.26	-0.45	-0.19	-0.12
	0.16	*0.60*	*0.47*	*0.29*
Difference of means between Quintiles 1 and 5 and its t-stat	-0.14***	0.27**	-0.38***	-0.53***
	-2.68	*2.31*	*-4.58*	*-7.44*
ANOVA between all subsets (F-value) and its P-value	2.30*	15.13***	22.14***	30.11***
	0.06	*0.00*	*0.00*	*0.00*
ANOVA between Q2, Q3 and Q4 (F-value) and its P-value	1.46	0.98	6.28***	12.45***
	0.24	*0.38*	*0.00*	*0.00*
Kruskal-Wallis test (H-value) between all subsets	13.68***	48.74***	74.27***	77.67***
Kruskal-Wallis test (H-value) between Q2, Q3 and Q4	1.29	3.92	13.52***	17.42***
Note: The coefficients in the return data are percentages (e.g. 1.00 = 1%)				
Statistical significance: * < 10%, ** < 5%, *** < 1%				

Table 18. 5-year period for EURO HY OAS Spread

The mean value of the estimated risk-adjusted performance and its standard deviation				
5-year period for EURO HY OAS Spread				
Subset	*Benchmark-adjusted return*	*CAPM Alpha*	*Fama-French Alpha*	*Carhart´s 4-factor Alpha*
Quintile 1 (low value)	0.12 *0.11*	-0.17 *0.15*	-0.33 *0.09*	-0.27 *0.09*
Quintile 2	0.18 *0.11*	-0.09 *0.25*	-0.23 *0.33*	-0.15 *0.35*
Quintile 3	0.18 *0.11*	0.13 *0.34*	0.32 *0.38*	0.42 *0.45*
Quintile 4	0.23 *0.16*	0.07 *0.39*	0.22 *0.54*	0.34 *0.64*
Quintile 5 (high value)	0.33 *0.15*	-0.10 *0.34*	-0.06 *0.32*	0.04 *0.26*
Difference of means between Quintiles 1 and 5 and its t-stat	-0.21*** *-6.32*	-0.07 *-1.01*	-0.27*** *-4.69*	-0.31*** *-6.67*
ANOVA between all subsets (F-value) and its P-value	11.55*** *0.00*	5.11*** *0.00*	18.80*** *0.00*	17.14*** *0.00*
ANOVA between Q2, Q3 and Q4 (F-value) and its P-value	1.48 *0.23*	3.49** *0.03*	14.61*** *0.00*	11.98*** *0.00*
Kruskal-Wallis test (H-value) between all subsets	34.51***	21.90***	55.66***	59.95***
Kruskal-Wallis test (H-value) between Q2, Q3 and Q4	2.35	11.99***	27.48***	25.85***

Note: The coefficients in the return data are percentages (e.g. 1.00 = 1%)
Statistical significance: * < 10%, ** < 5%, *** < 1%

Table 19. 3-year period for BW Sentiment Index

The mean value of the estimated risk-adjusted performance and its standard deviation				
3-year period for BW Sentiment Index				
Subset	*Benchmark-adjusted return*	*CAPM Alpha*	*Fama-French Alpha*	*Carhart´s 4-factor Alpha*
Quintile 1 (low value)	0.21 *0.27*	0.48 *0.30*	0.16 *0.43*	-0.09 *0.46*
Quintile 2	0.41 *0.20*	0.34 *0.37*	0.12 *0.48*	0.02 *0.47*
Quintile 3	0.22 *0.28*	0.17 *0.62*	-0.01 *0.88*	-0.03 *0.97*
Quintile 4	0.12 *0.11*	0.32 *0.83*	0.28 *0.91*	0.09 *0.62*
Quintile 5 (high value)	0.02 *0.08*	-0.77 *0.50*	-0.39 *0.35*	-0.22 *0.25*
Difference of means between Quintiles 1 and 5 and its t-stat	0.19*** *3.97*	1.24*** *12.90*	0.55*** *5.99*	0.13 *1.46*
ANOVA between all subsets (F-value) and its P-value	17.78*** *0.00*	29.22*** *0.00*	35.98*** *0.00*	1.42 *0.23*
ANOVA between Q2, Q3 and Q4 (F-value) and its P-value	18.32*** *0.00*	0.78 *0.46*	1.28 *0.28*	0.24 *0.79*
Kruskal-Wallis test (H-value) between all subsets	49.77***	76.81***	27.95***	10.72***
Kruskal-Wallis test (H-value) between Q2, Q3 and Q4	25.19***	0.36	4.35	3.29

Note: The coefficients in the return data are percentages (e.g. 1.00 = 1%)
Statistical significance: * < 10%, ** < 5%, *** < 1%

Table 20. 5-year period for BW Sentiment Index

The mean value of the estimated risk-adjusted performance and its standard deviation				
5-year period for BW Sentiment Index				
Subset	*Benchmark-adjusted return*	*CAPM Alpha*	*Fama-French Alpha*	*Carhart´s 4-factor Alpha*
Quintile 1 (low value)	0.20	0.15	-0.12	-0.12
	0.13	*0.22*	*0.47*	*0.42*
Quintile 2	0.19	0.04	-0.10	-0.02
	0.11	*0.22*	*0.38*	*0.38*
Quintile 3	0.21	0.06	0.16	0.28
	0.13	*0.25*	*0.51*	*0.59*
Quintile 4	0.14	0.01	0.11	0.21
	0.16	*0.35*	*0.48*	*0.59*
Quintile 5 (high value)	0.29	-0.40	-0.13	0.03
	0.17	*0.21*	*0.20*	*0.23*
Difference of means between Quintiles 1 and 5 and its t-stat	-0.09***	0.55***	0.01	-0.16**
	-2.42	*10.04*	*0.16*	*-1.81*
ANOVA between all subsets (F-value) and its P-value	4.79***	22.61***	3.35**	4.02***
	0.01	*0.00*	*0.02*	*0.00*
ANOVA between Q2, Q3 and Q4 (F-value) and its P-value	2.23	0.30	2.78*	2.76*
	0.11	*0.74*	*0.07*	*0.07*
Kruskal-Wallis test (H-value) between all subsets	17.10***	60.84***	8.50**	8.01*
Kruskal-Wallis test (H-value) between Q2, Q3 and Q4	5.40	0.75	5.32	3.88
Note: The coefficients in the return data are percentages (e.g. 1.00 = 1%)				
Statistical significance: * < 10%, ** < 5%, *** < 1%				

Table 21. 3-year period for HJTZ Sentiment Index

The mean value of the estimated risk-adjusted performance and its standard deviation				
3-year period for HJTZ Sentiment Index				
Subset	*Benchmark-adjusted return*	*CAPM Alpha*	*Fama-French Alpha*	*Carhart´s 4-factor Alpha*
Quintile 1 (low value)	-0.02 *0.08*	0.06 *0.57*	-0.10 *0.64*	-0.17 *0.56*
Quintile 2	0.35 *0.27*	0.31 *0.52*	-0.16 *0.63*	-0.24 *0.76*
Quintile 3	0.33 *0.24*	0.45 *0.52*	0.26 *0.73*	0.07 *0.74*
Quintile 4	0.26 *0.18*	0.32 *0.85*	0.36 *0.81*	0.16 *0.41*
Quintile 5 (high value)	0.06 *0.15*	-0.60 *0.50*	-0.20 *0.40*	-0.05 *0.36*
Difference of means between Quintiles 1 and 5 and its t-stat	-0.08*** *-2.74*	0.66*** *5.26*	0.10 *0.83*	-0.12 *-1.11*
ANOVA between all subsets (F-value) and its P-value	25.96*** *0.00*	17.54*** *0.00*	5.65*** *0.00*	2.81** *0.03*
ANOVA between Q2, Q3 and Q4 (F-value) and its P-value	1.53 *0.22*	0.55 *0.58*	5.15*** *0.01*	3.61** *0.03*
Kruskal-Wallis test (H-value) between all subsets	68.97***	48.90***	18.16***	13.98***
Kruskal-Wallis test (H-value) between Q2, Q3 and Q4	4.34	1.88	10.88***	10.69***
Note: The coefficients in the return data are percentages (e.g. 1.00 = 1%) Statistical significance: * < 10%, ** < 5%, *** < 1%				

Table 22. 5-year period for HJTZ Sentiment Index

The mean value of the estimated risk-adjusted performance and its standard deviation				
5-year period for HJTZ Sentiment Index				
Subset	*Benchmark-adjusted return*	*CAPM Alpha*	*Fama-French Alpha*	*Carhart´s 4-factor Alpha*
Quintile 1 (low value)	0.13 *0.13*	-0.14 *0.18*	-0.36 *0.24*	-0.31 *0.23*
Quintile 2	0.24 *0.13*	-0.01 *0.15*	-0.16 *0.50*	-0.06 *0.59*
Quintile 3	0.22 *0.14*	0.16 *0.27*	0.18 *0.49*	0.26 *0.55*
Quintile 4	0.20 *0.17*	0.14 *0.33*	0.23 *0.49*	0.30 *0.42*
Quintile 5 (high value)	0.24 *0.14*	-0.31 *0.34*	0.02 *0.20*	0.17 *0.18*
Difference of means between Quintiles 1 and 5 and its t-stat	-0.11*** *-3.28*	0.17*** *2.46*	-0.38*** *-6.71*	-0.48*** *-9.20*
ANOVA between all subsets (F-value) and its P-value	3.13** *0.02*	16.99*** *0.00*	12.56*** *0.00*	11.12*** *0.00*
ANOVA between Q2, Q3 and Q4 (F-value) and its P-value	0.66 *0.52*	4.10** *0.02*	6.64*** *0.00*	4.41** *0.01*
Kruskal-Wallis test (H-value) between all subsets	12.80***	48.74***	47.97***	56.59***
Kruskal-Wallis test (H-value) between Q2, Q3 and Q4	0.90	6.85	13.94***	17.69***
Note: The coefficients in the return data are percentages (e.g. 1.00 = 1%) Statistical significance: * < 10%, ** < 5%, *** < 1%				

Figures 1 and 2 present the average monthly observations of mutual fund performance and Figures 3 to 9 the corresponding explanatory variables.

Figure 1. Average Monthly Risk-adjusted Returns (3-year periods) during January 1998 to December 2015

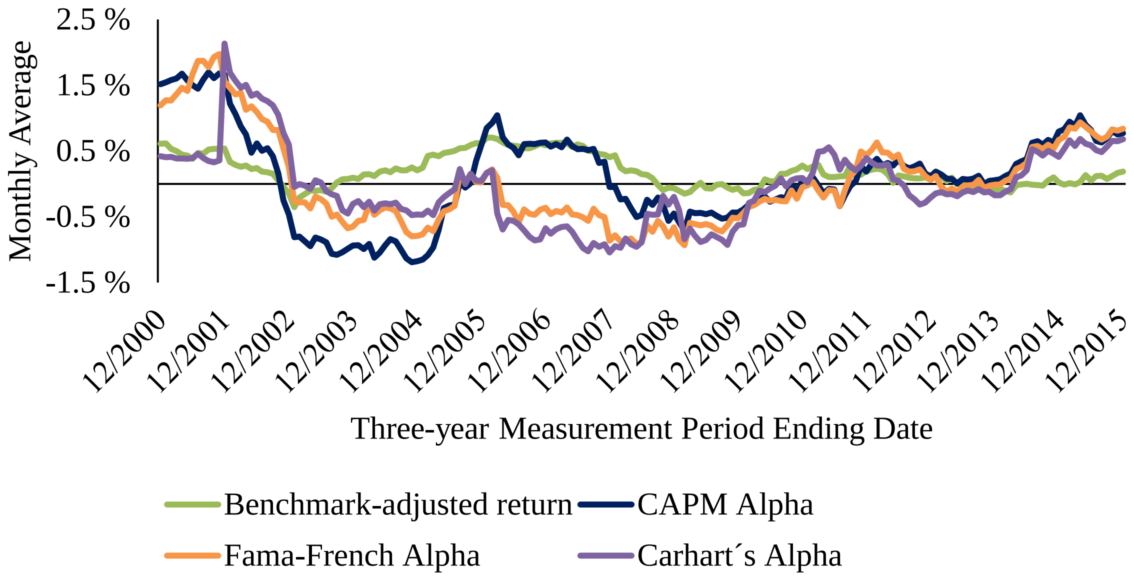


Figure 2. Average Monthly Risk-adjusted Returns (5-year periods) during January 1998 to December 2015

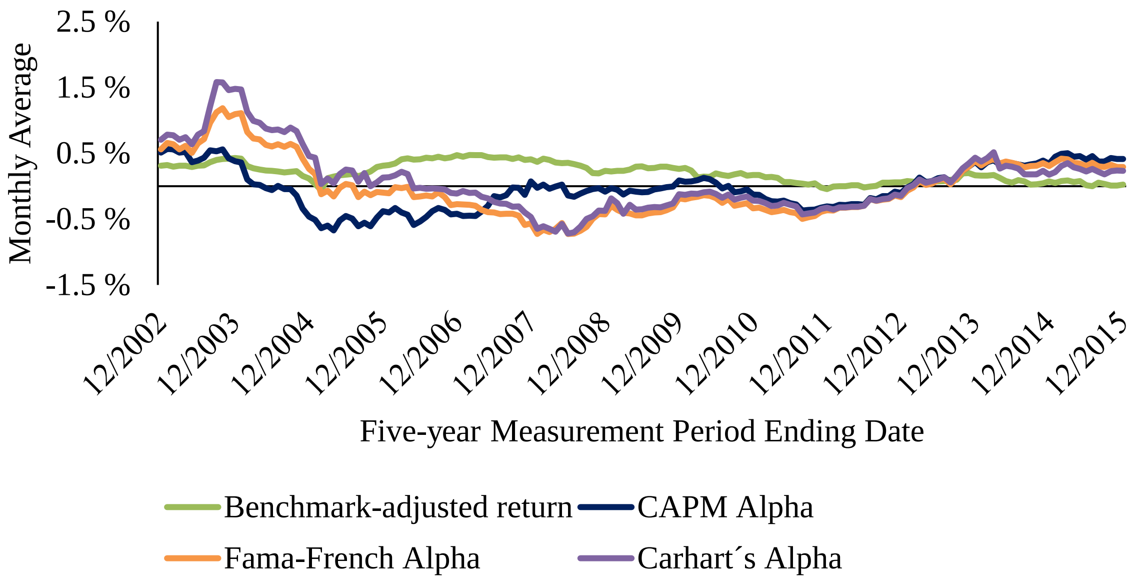


Figure 3. Monthly Values of Bull-Bear Spread

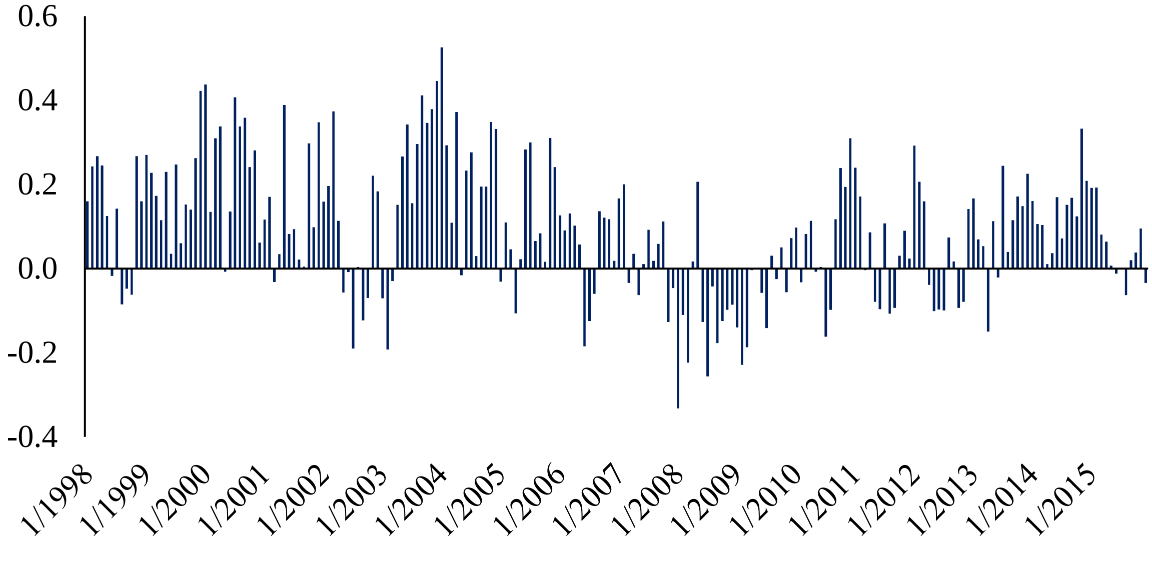


Figure 4. Monthly Values of CBOE Volatility Index (VIX)

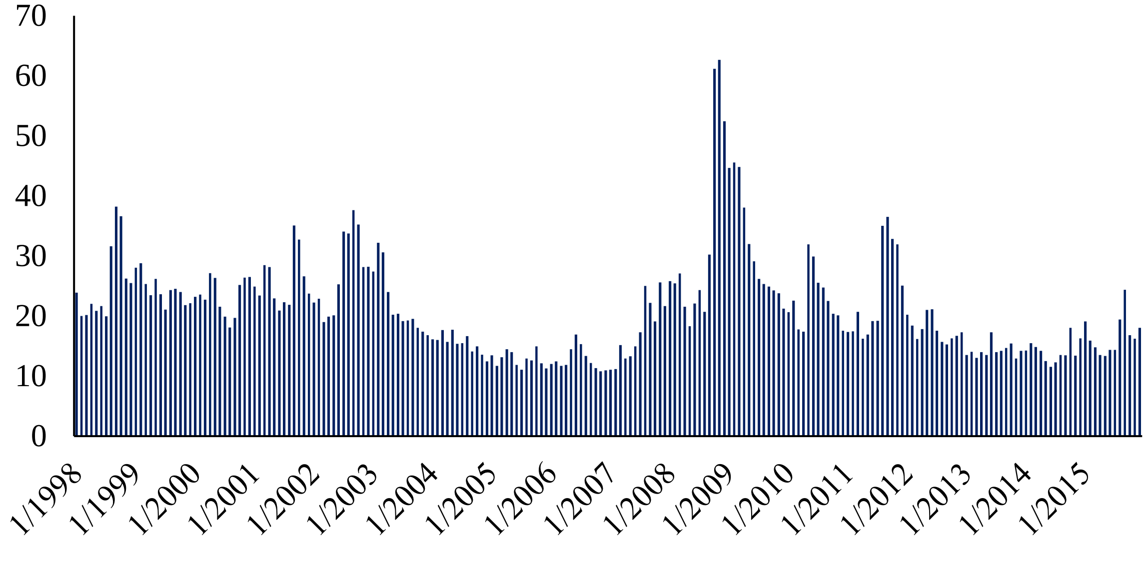


Figure 5. Monthly Values of Economic Sentiment Index (ESI)

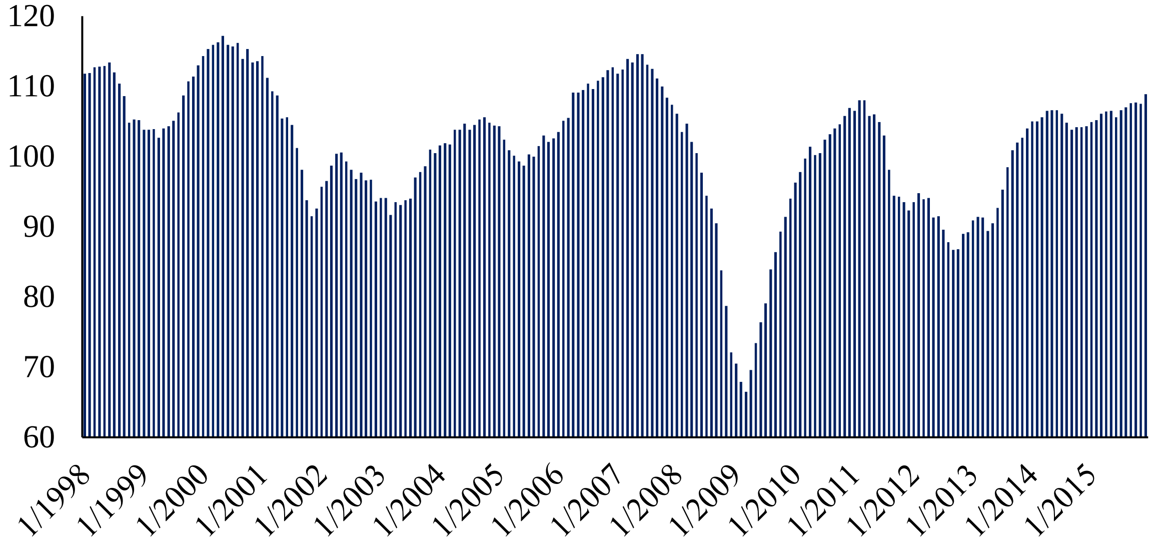


Figure 6. Monthly Values of EURO HY OAS Spread

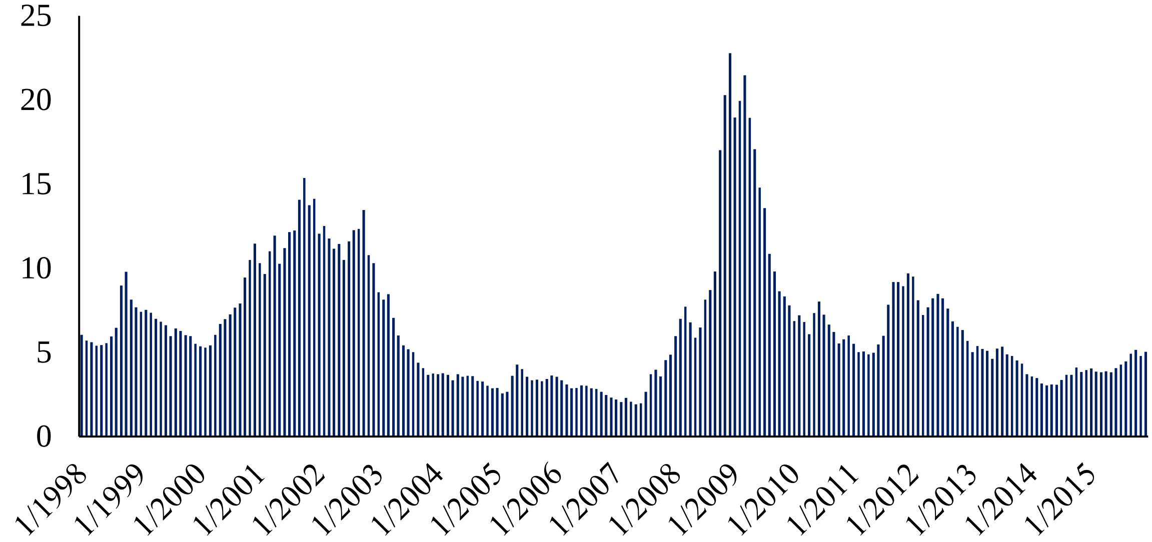


Figure 7. Monthly Values of Recession Month (1 = Yes, 0 = No recession)

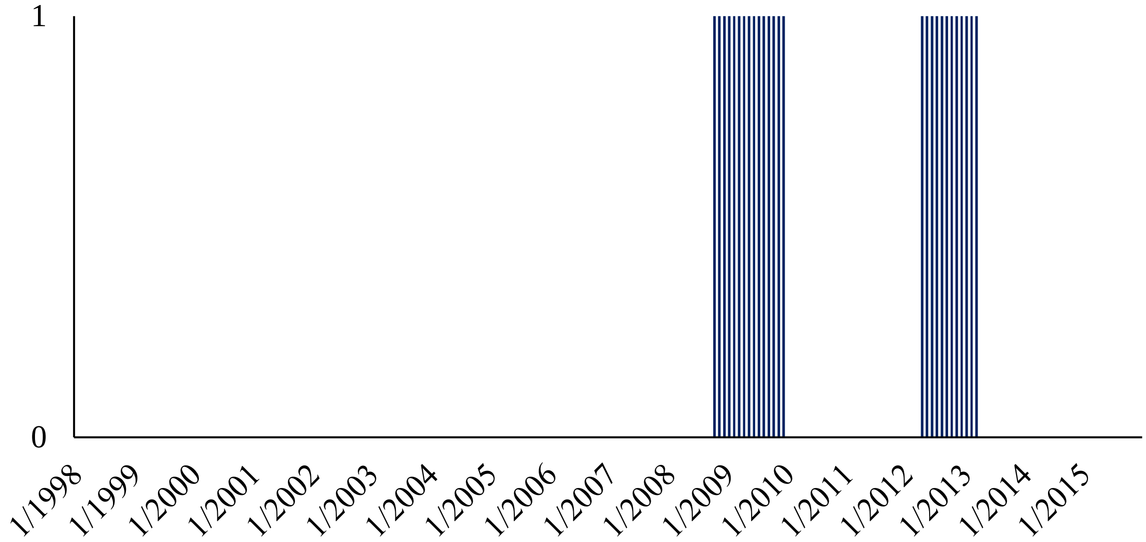


Figure 8. Monthly Values of BW Sentiment Index[31]

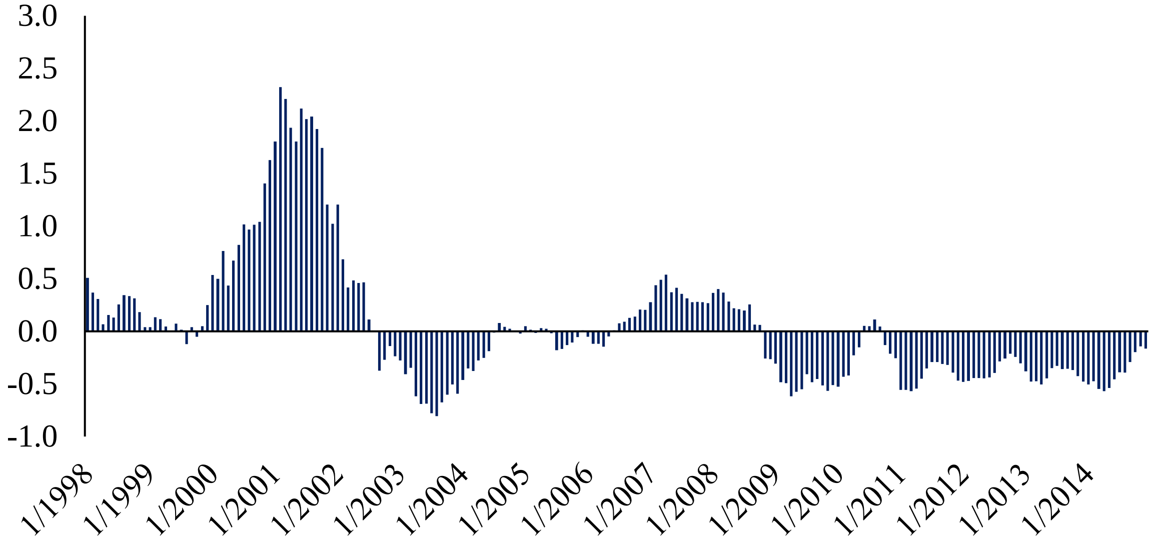
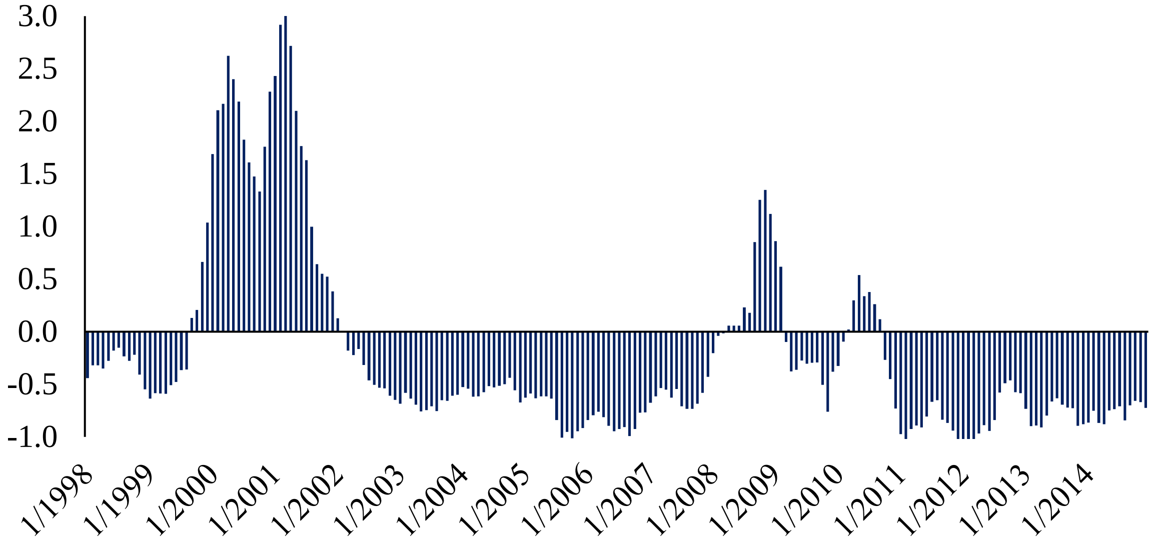


Figure 9. Monthly Values of HJTZ Sentiment Index[31]



[31] Monthly values of BW and HJTZ sentiment Index are available only until December 2014 on the webpage of Professor Guofu Zhou.